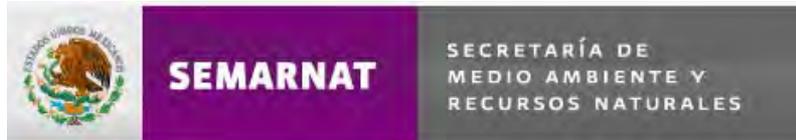


Restoration Efforts in the Colorado River Delta

Osvel Hinojosa-Huerta

Pronatura Noroeste







Colorado River

- >2,500 km from the Rocky Mountains to the Gulf of California
- Annual flow: 19,800 Mm³
- Allocated water rights: 23,125 Mm³
- Allocation to Mexico: 1,875 Mm³
- Over allocation of 16%

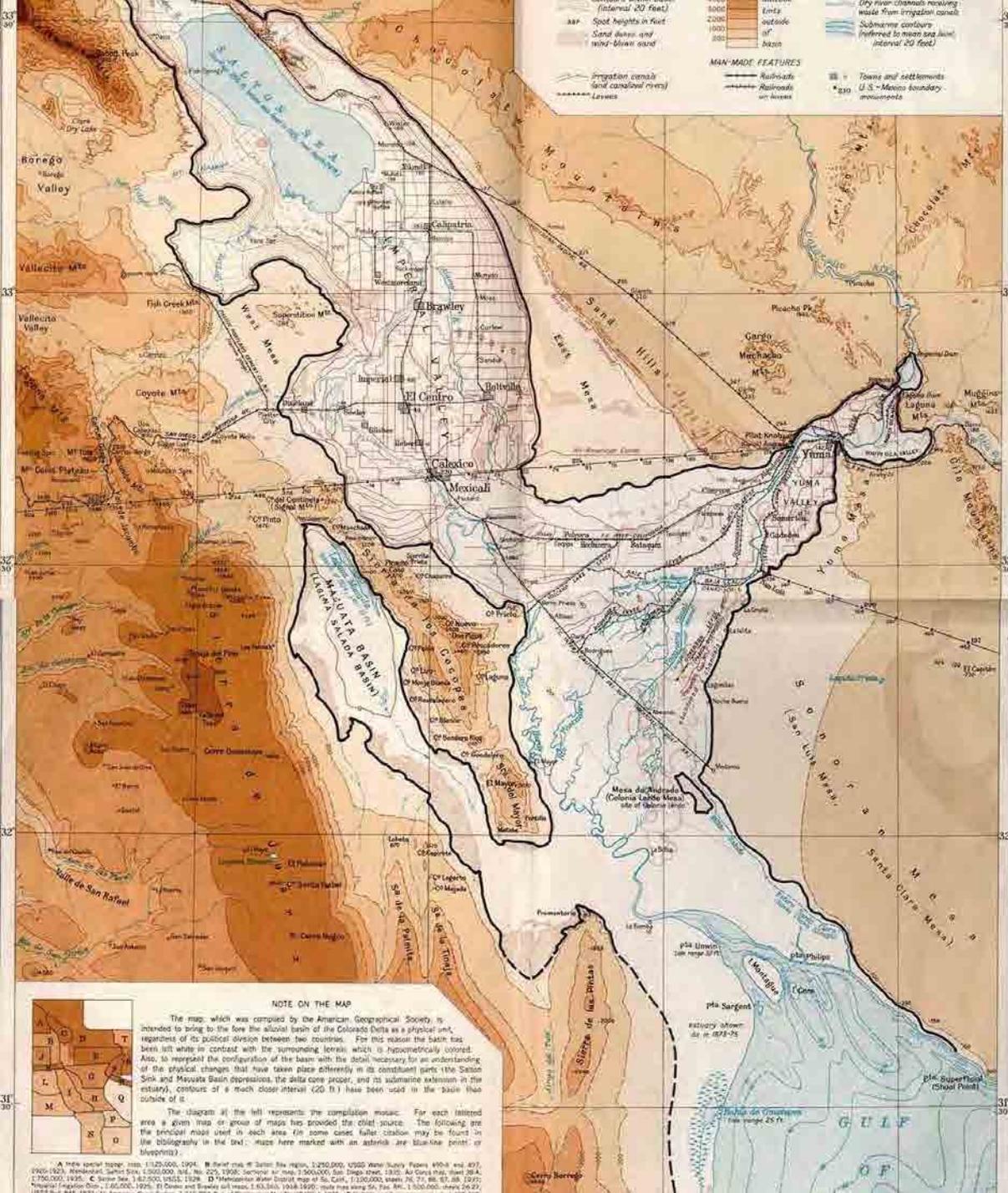
Colorado River

One of the most regulated rivers in the world:

- 10 major dams (4 times the annual flow)
- 80 major diversions
- 1.6 million ha of agriculture
- 30 million people: Denver, Los Angeles, San Diego, Las Vegas, Phoenix, Tijuana, Mexicali







Colorado River Delta

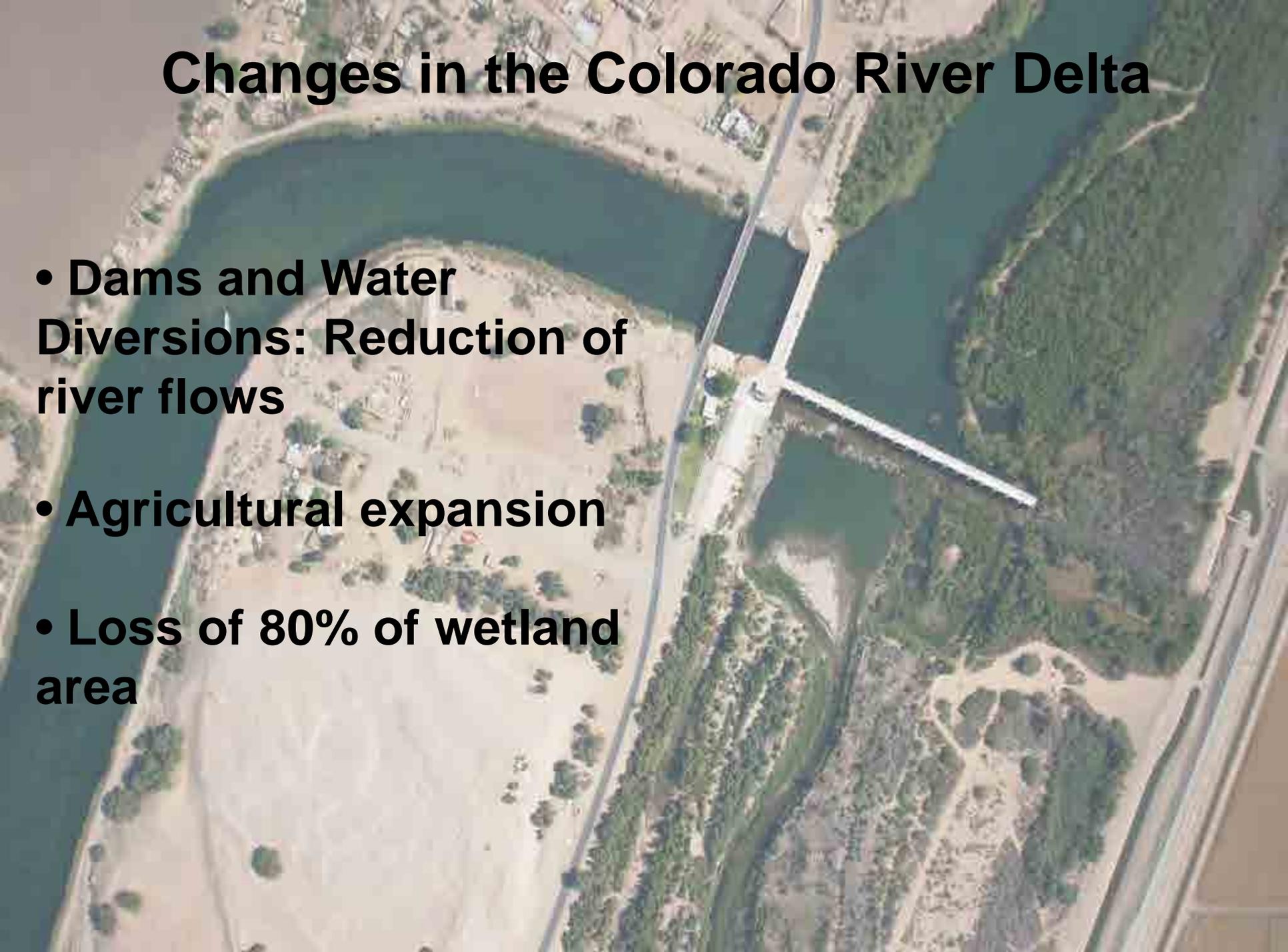
400,000 Ha

19,000 Mm³ of water per year to the Gulf of California

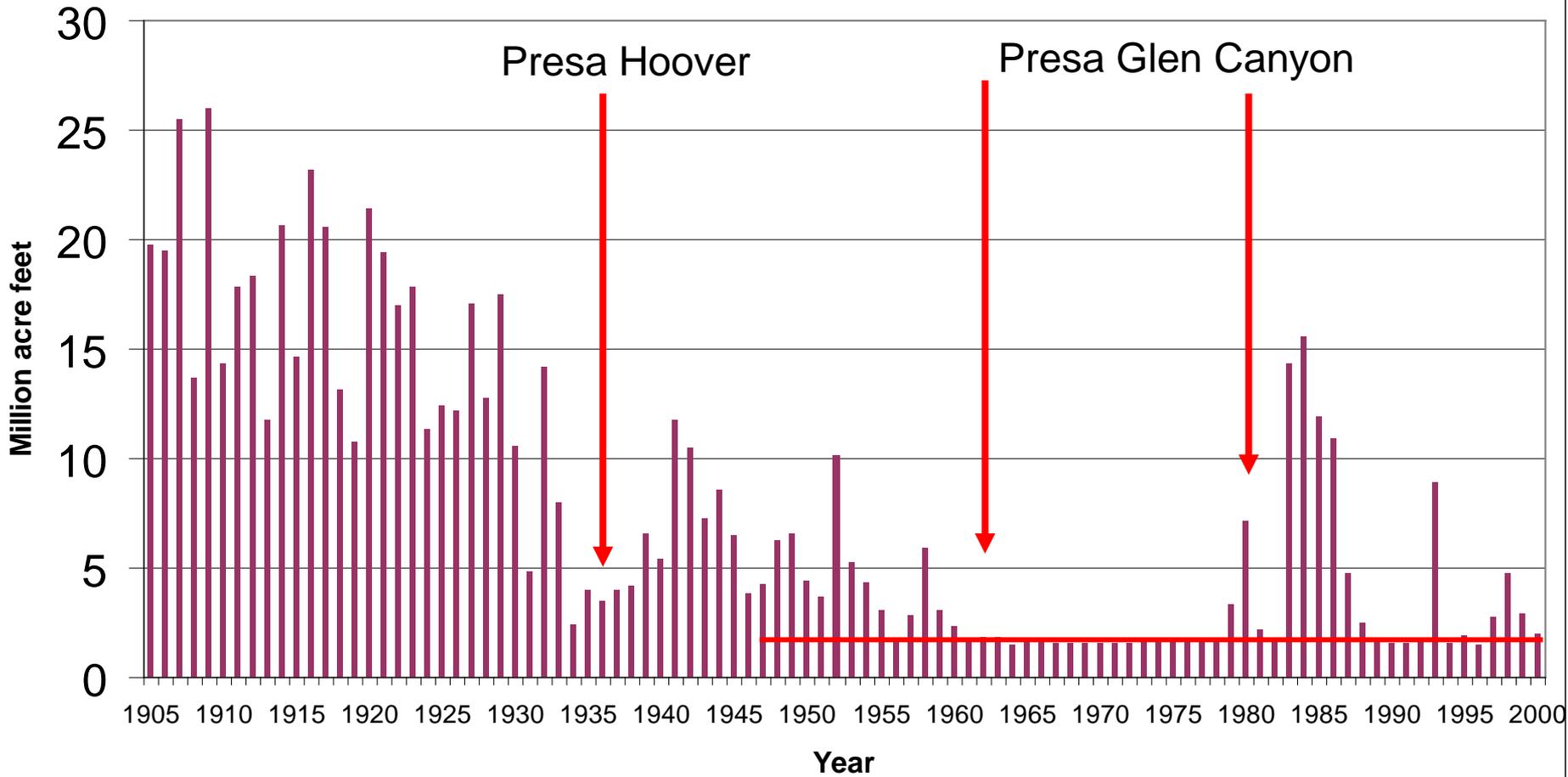
River influence extended 65 km into the sea

Extensive estuarine area (500,000 Ha)

Changes in the Colorado River Delta

An aerial photograph of the Colorado River Delta. A large concrete dam structure with multiple spillways is visible, crossing the river. The river flows from the top right towards the bottom left. On the left side of the river, there are large, flat, light-colored areas, likely agricultural fields or dry riverbeds. On the right side, there is a dense area of green vegetation, possibly a wetland or forest. The overall scene shows significant human intervention in the natural river system.

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

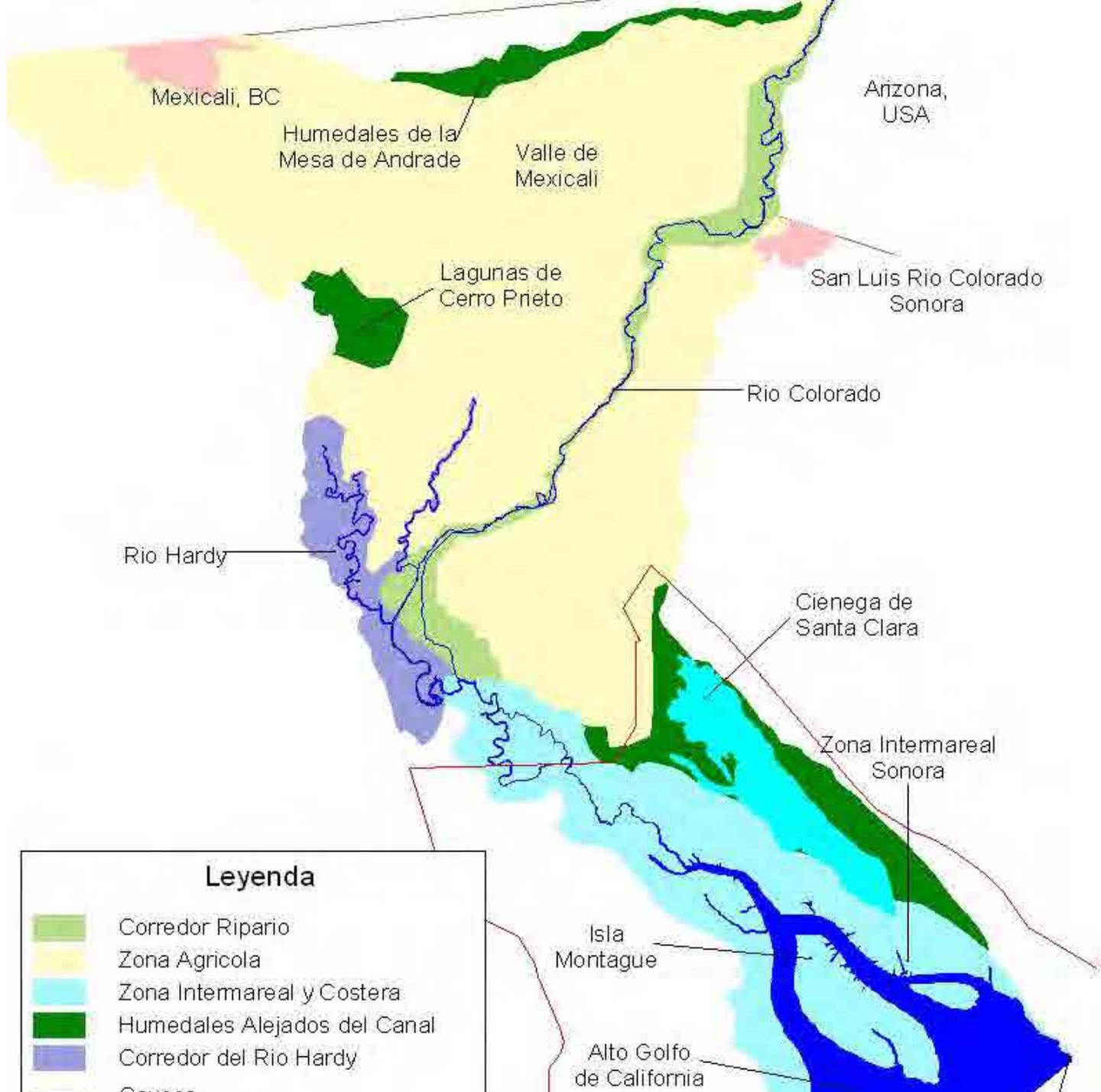


















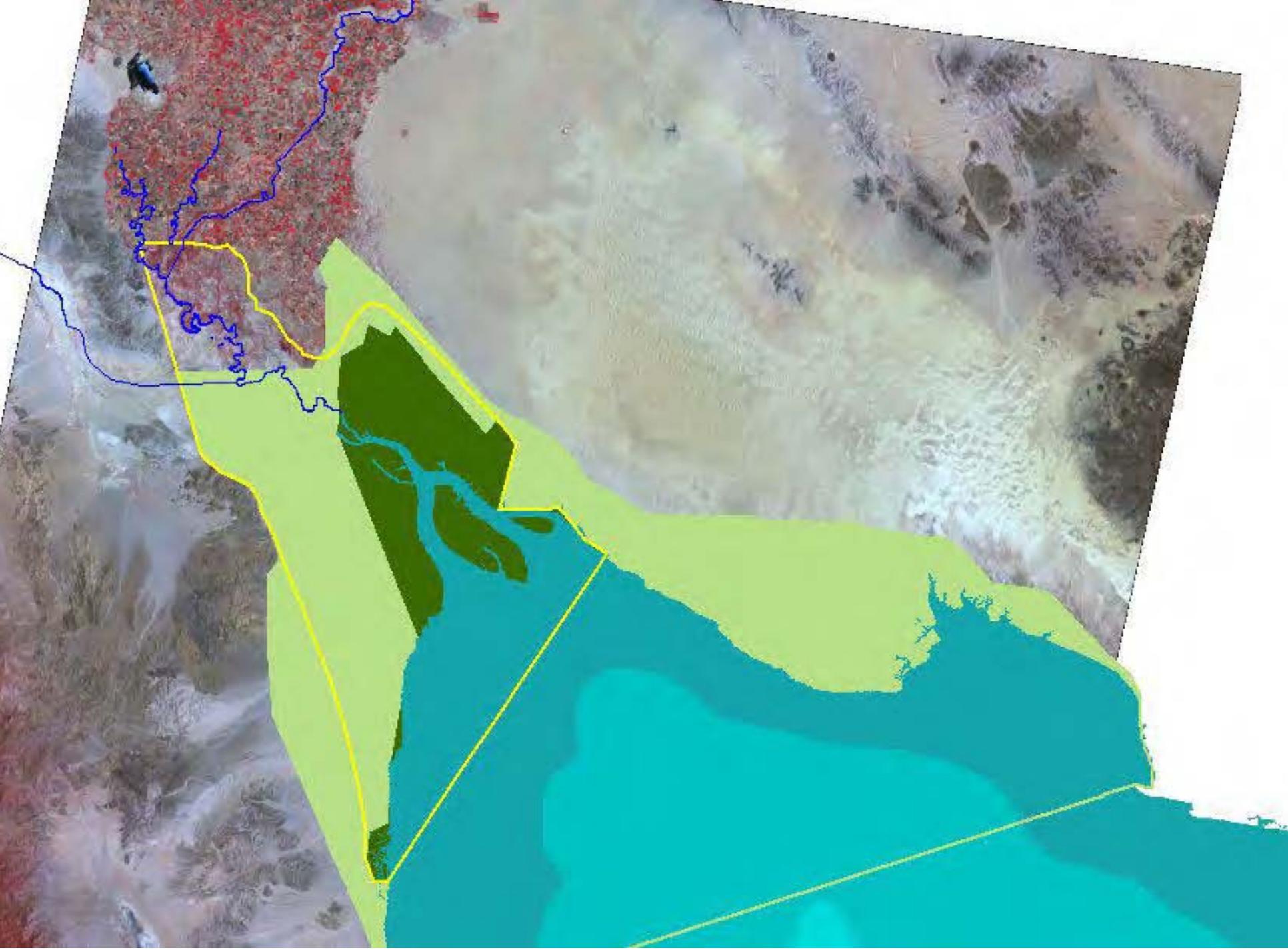
A large flock of birds, likely shorebirds, is captured in flight over a wetland landscape. The birds are scattered across the sky, with some in the foreground and others further back. The ground is covered in tall, golden-brown grasses, and a body of water is visible in the lower foreground. The sky is a pale, clear blue.

300,000 wintering
shorebirds

40,000 – 60,000
ducks and geese



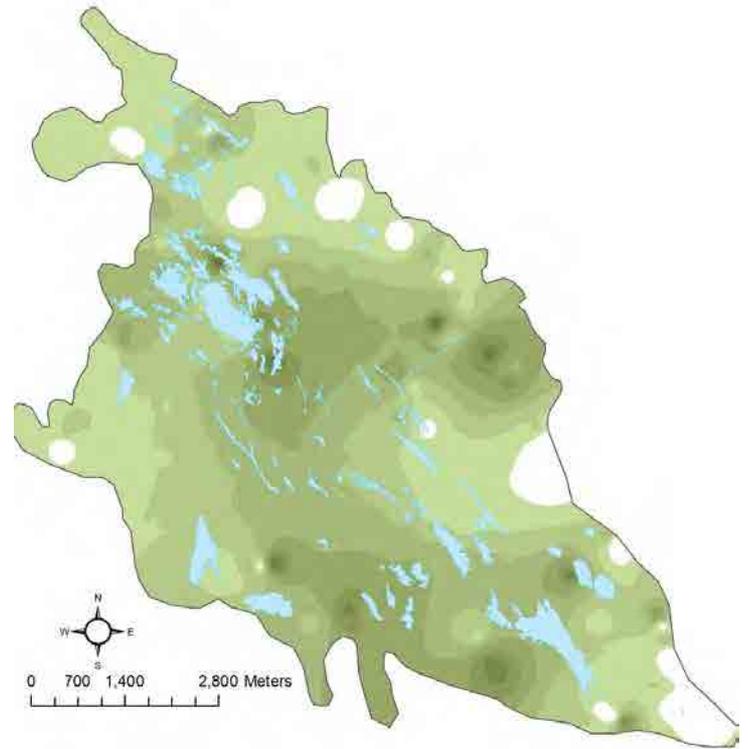
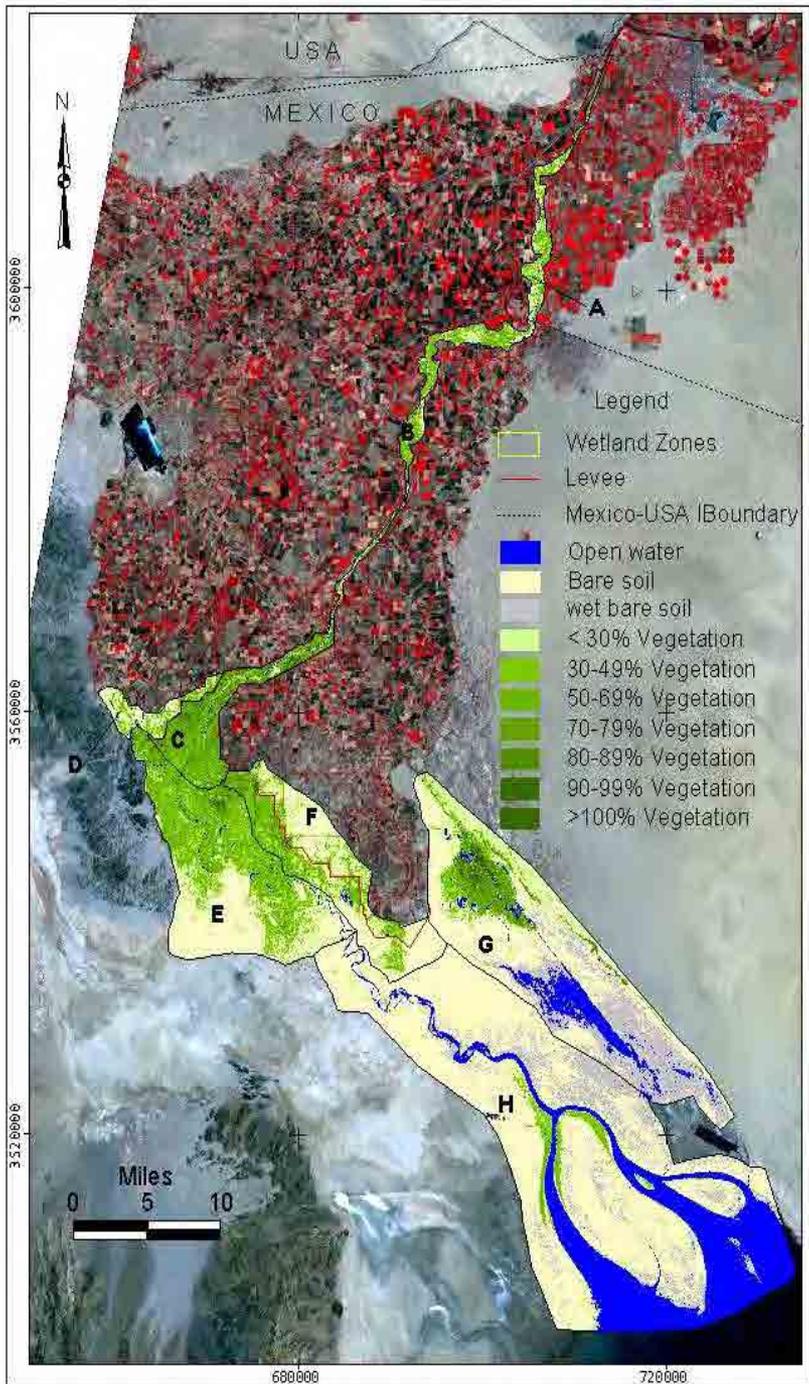


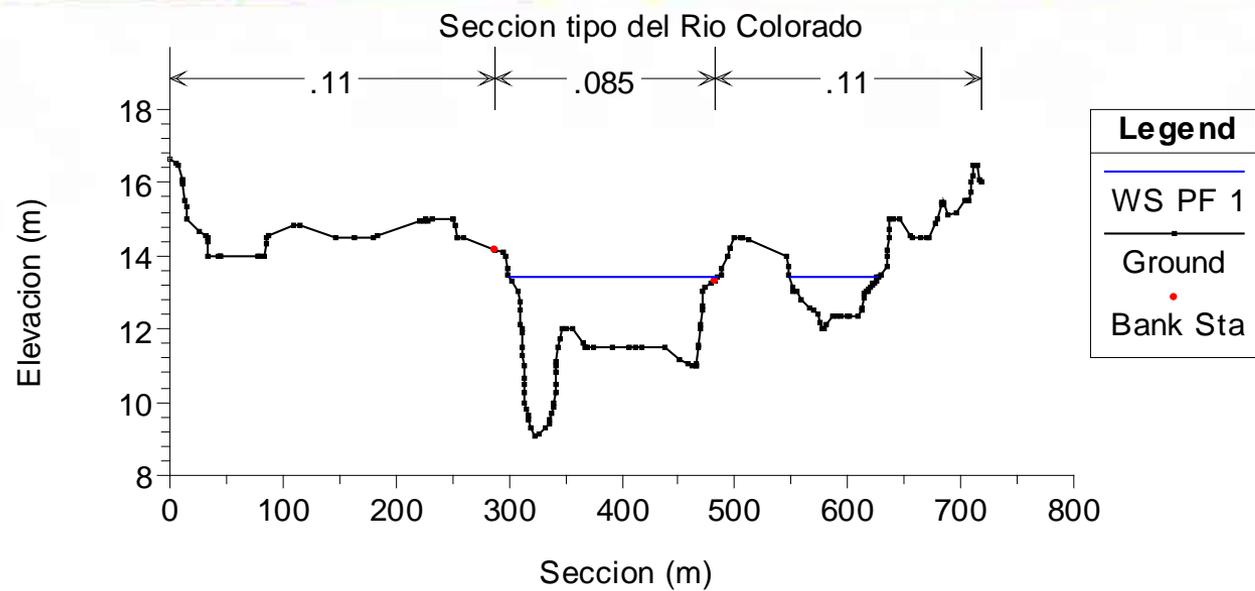


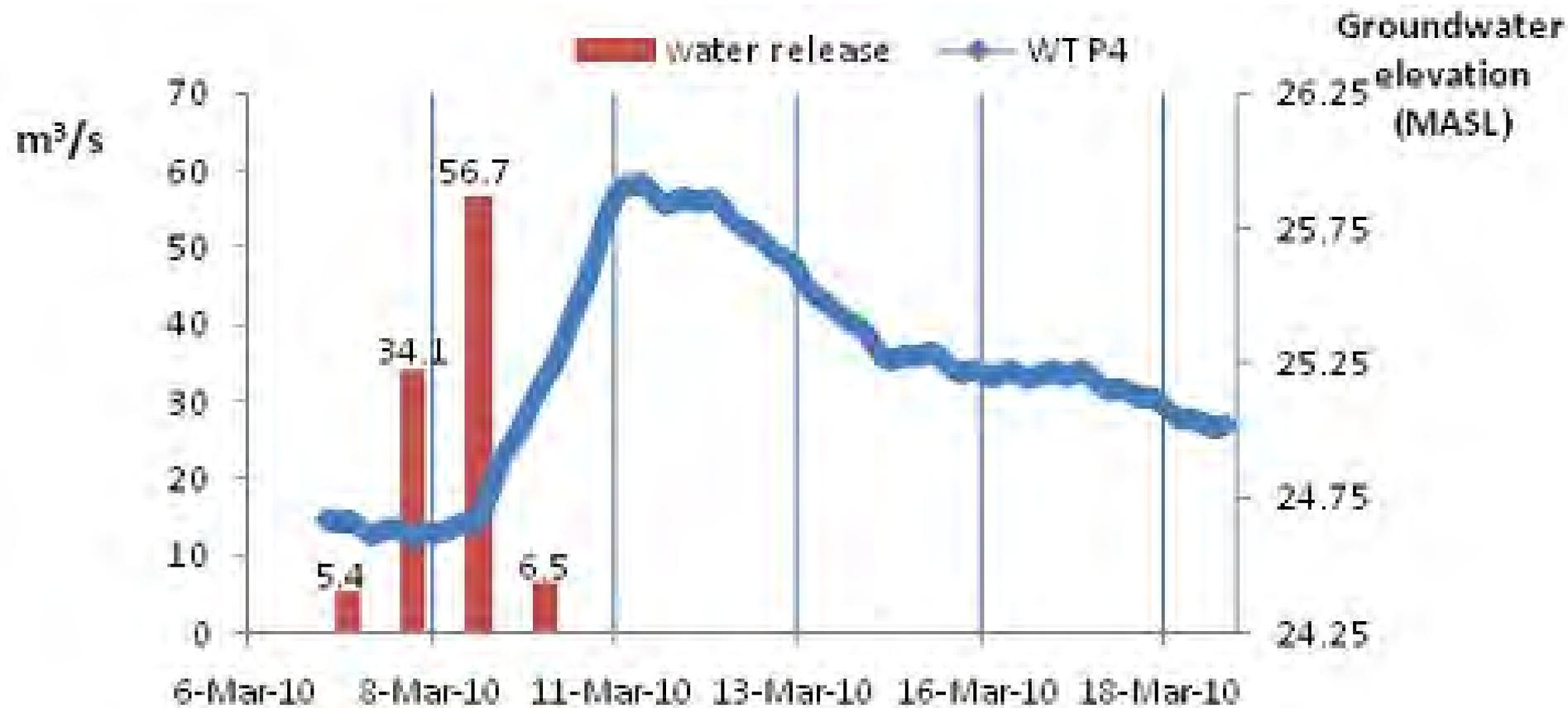
Restoration in the Colorado River Delta

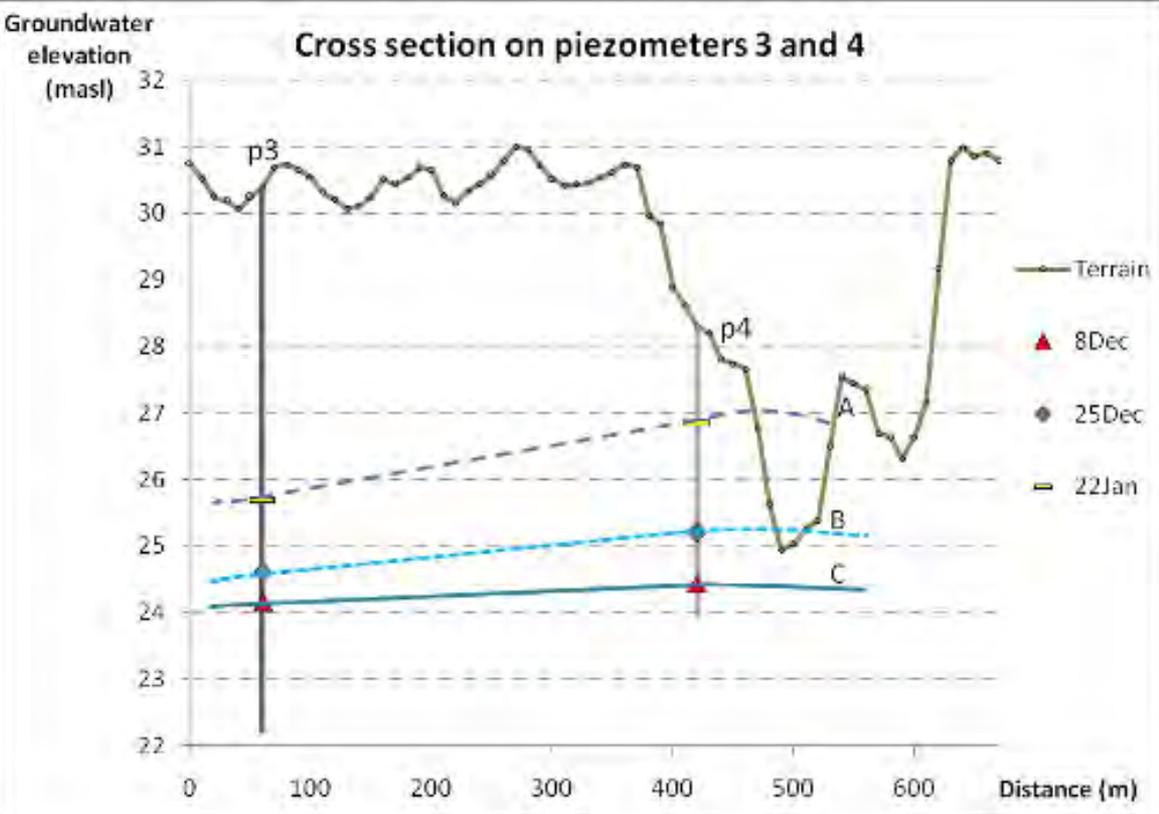
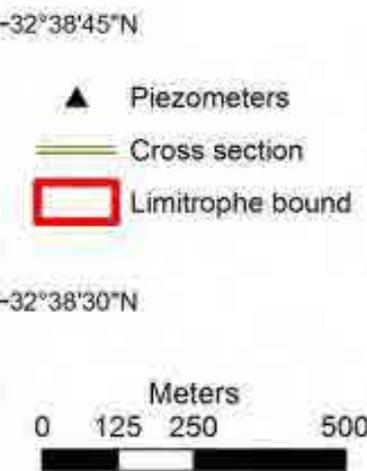
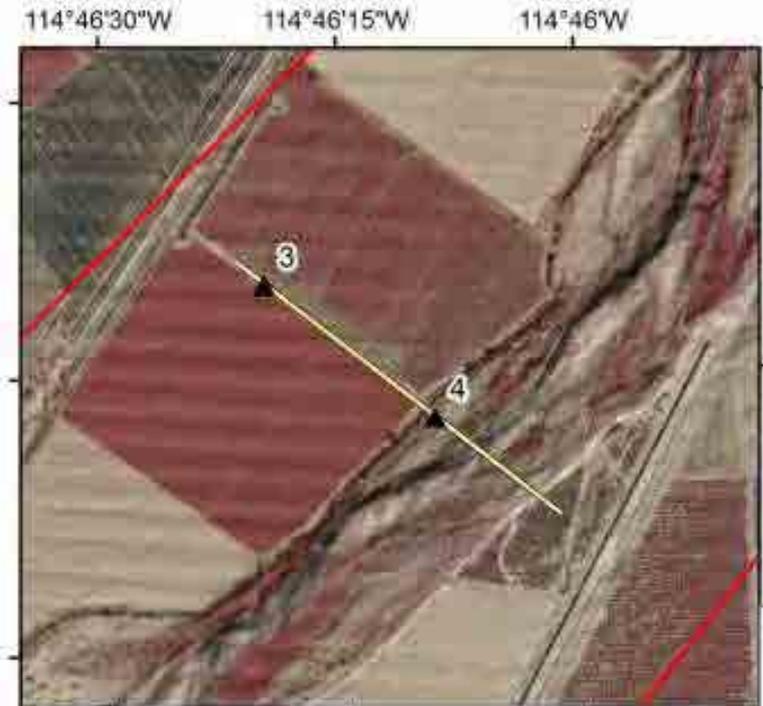
- Research, planning and identification of needs for the environment
- Public policy and outreach
- Implementation of tools











Avian Monitoring Program in the Colorado River Delta

- Evaluate population trends: measurement of ecosystem health
- Identify impacts and threats
- Evaluate management actions
- Guide conservation and restoration initiatives

Avian Monitoring Program in the Colorado River Delta

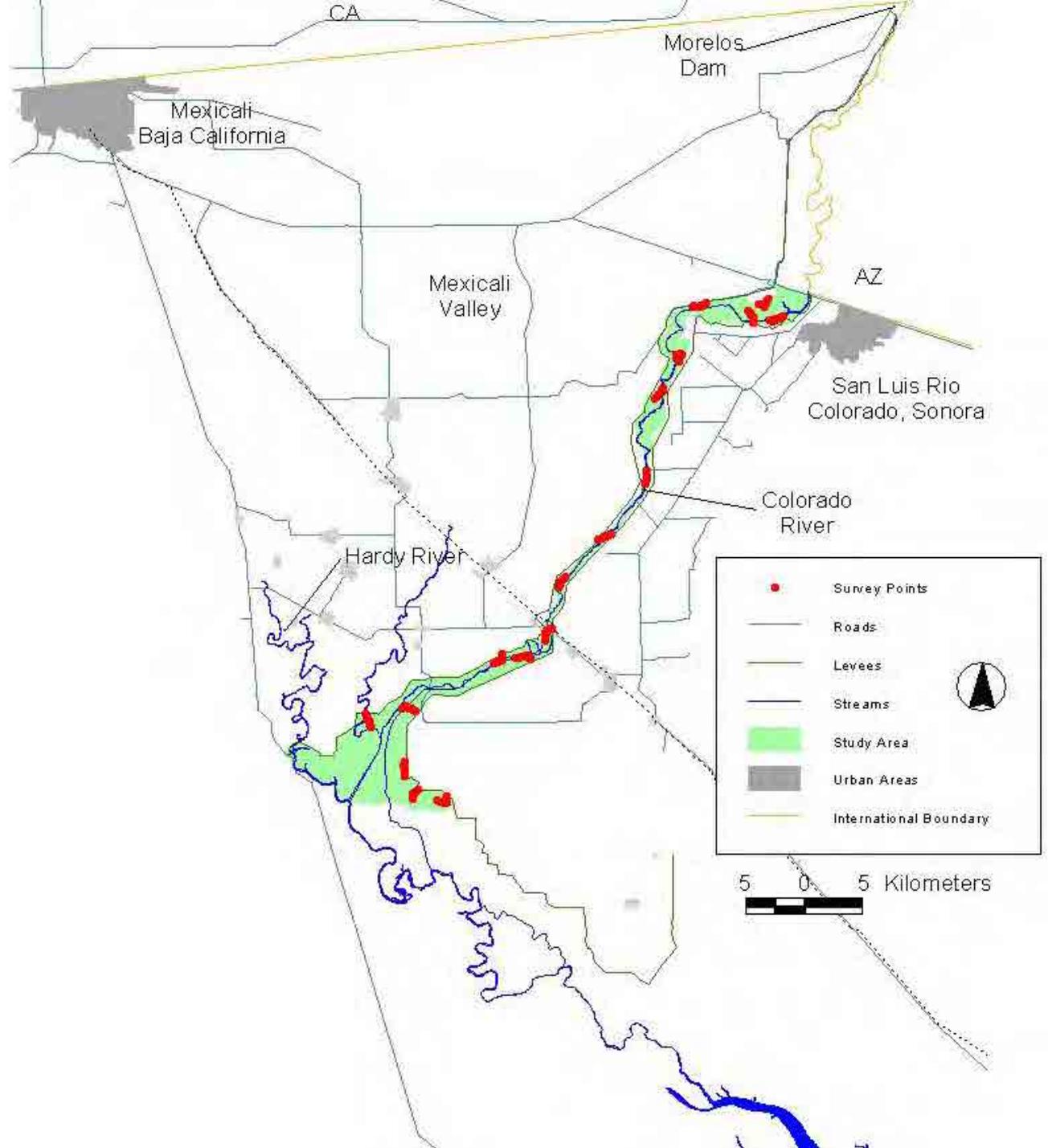
- **Monitoring of Riparian Birds**
- Marshbird Monitoring
- Shorebird counts (ground and aerial) in the delta and Upper Gulf of California
- Migration monitoring for landbirds in Spring: Mist-netting

Study Area

Riparian Corridor of the Colorado in Mexico

12,700 Ha

70 river km





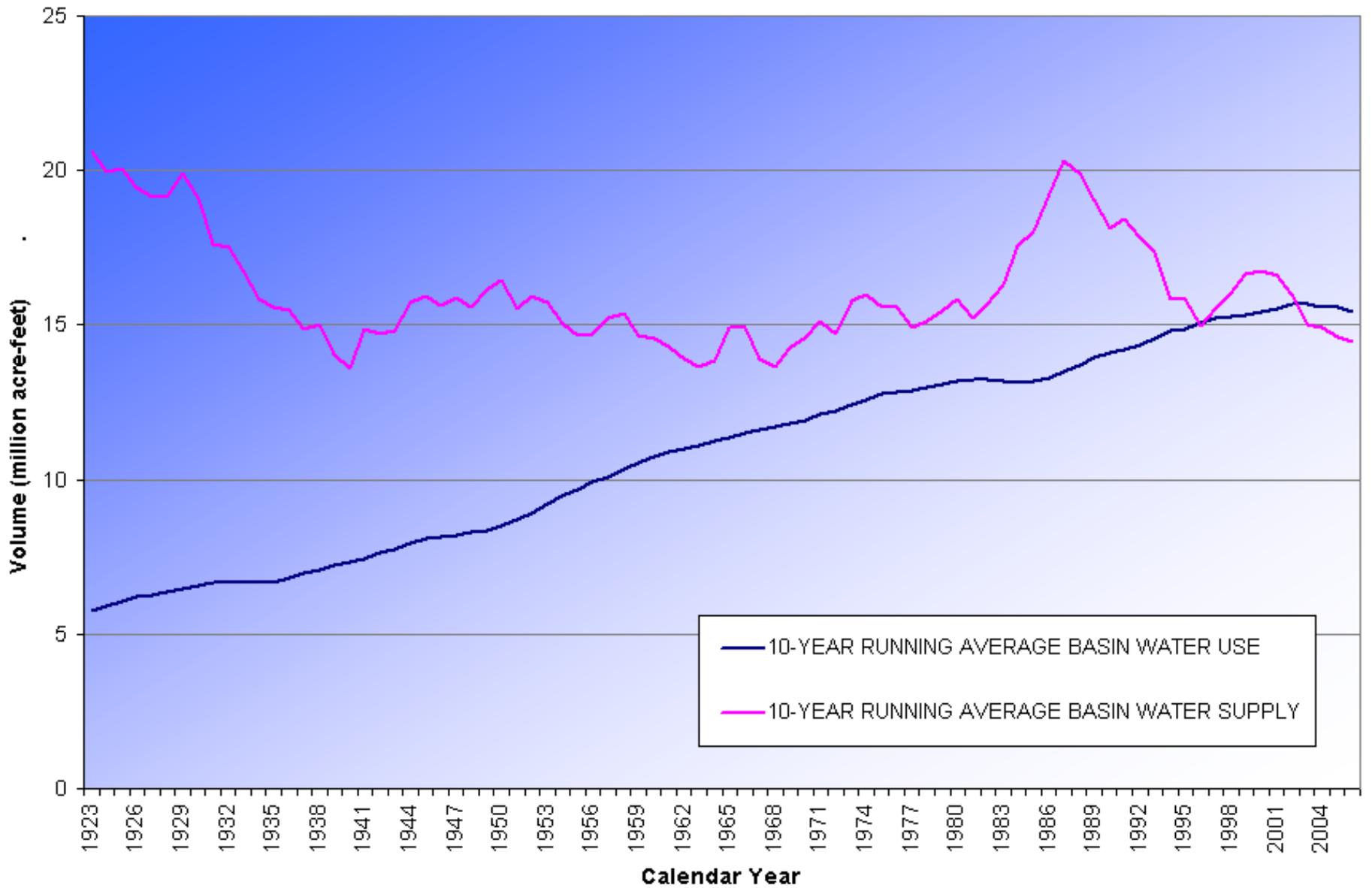


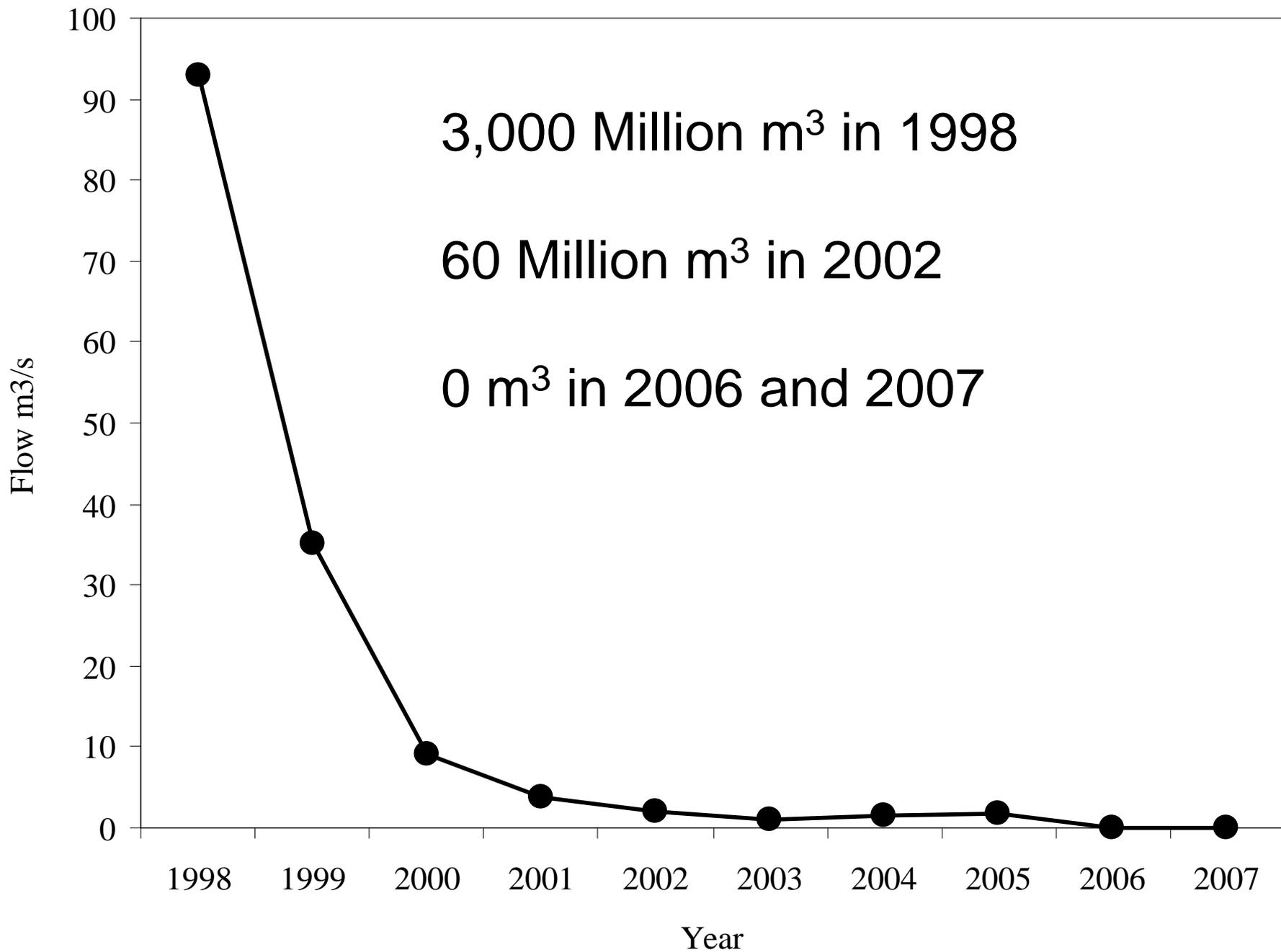
Drought in the Basin Since 2002

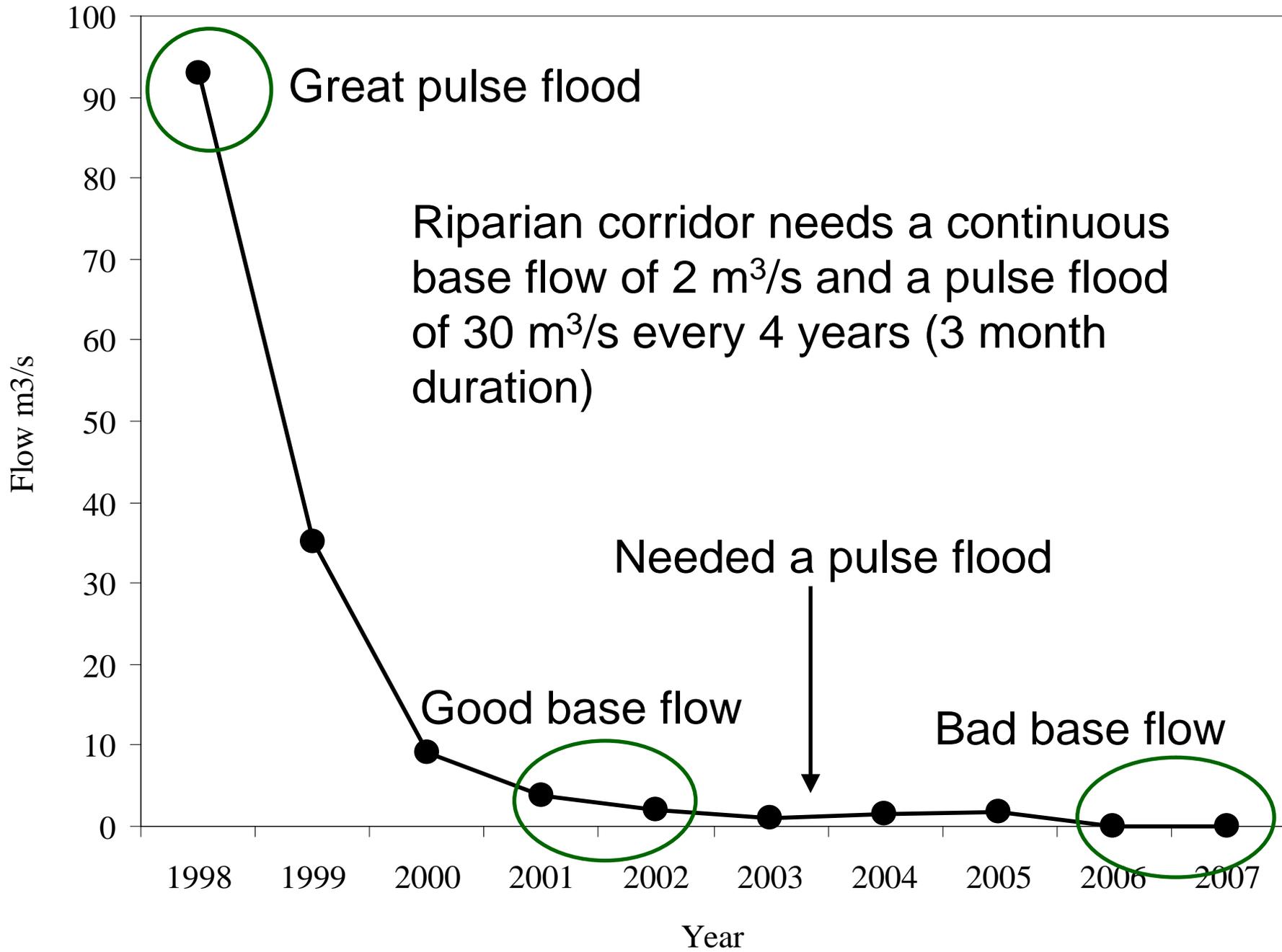
← April 3, 1999

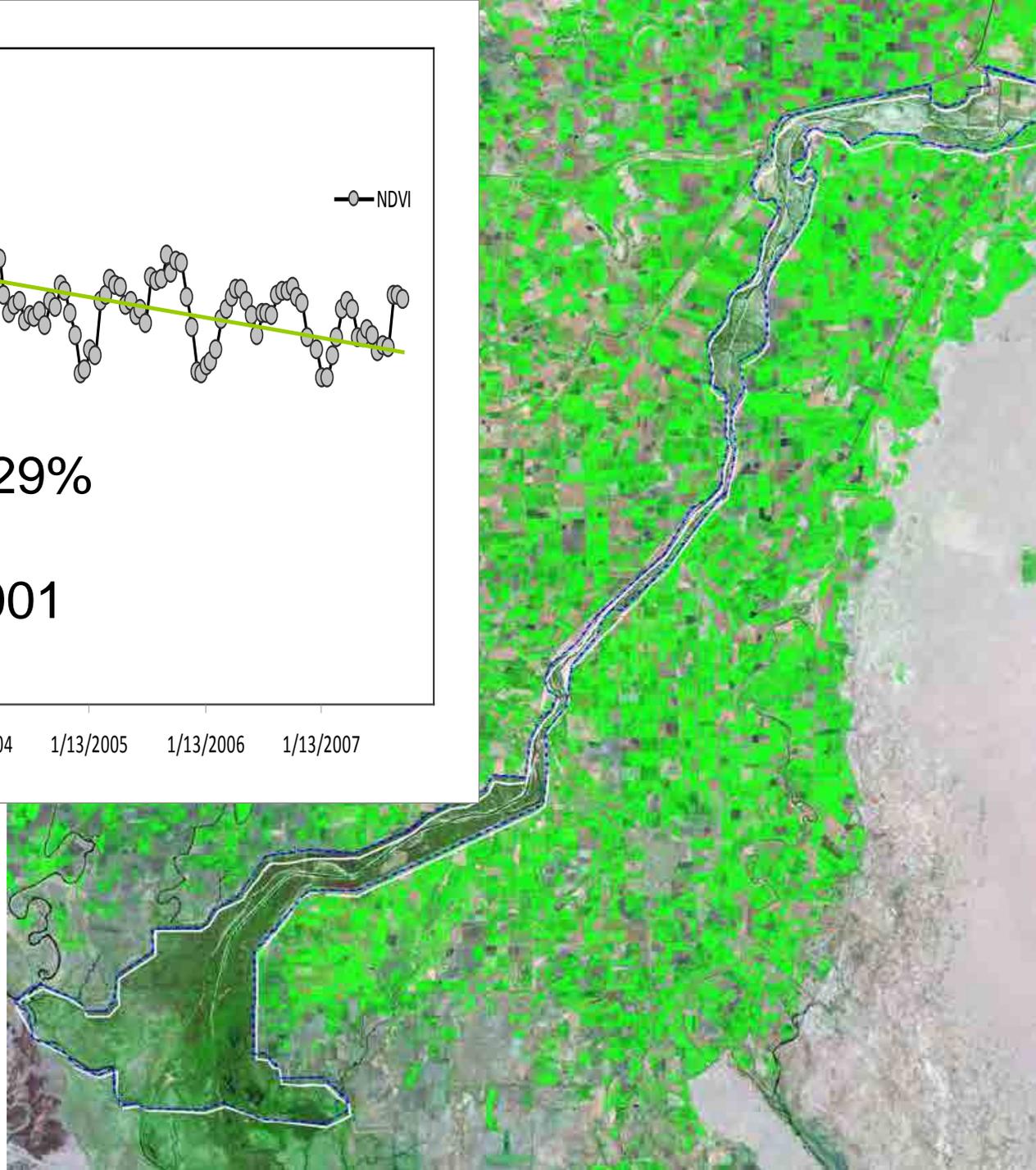
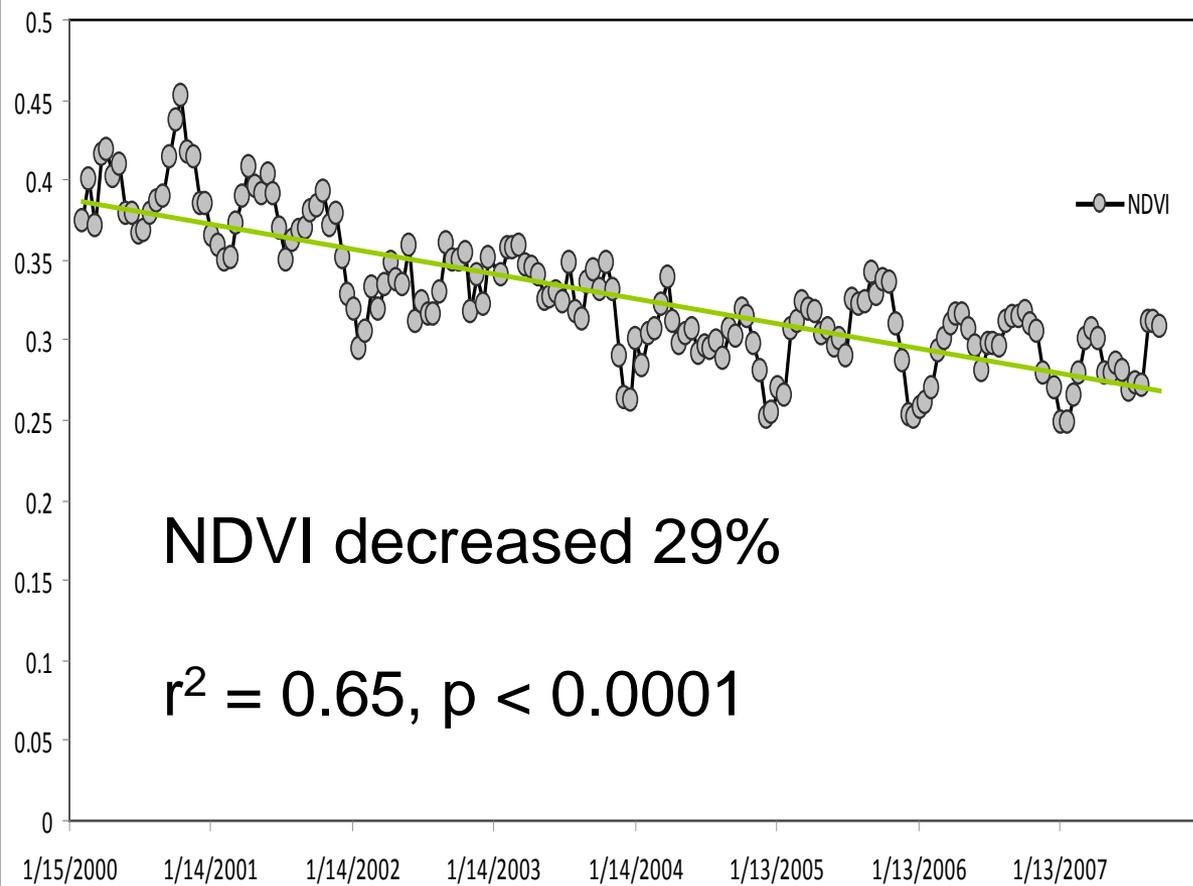


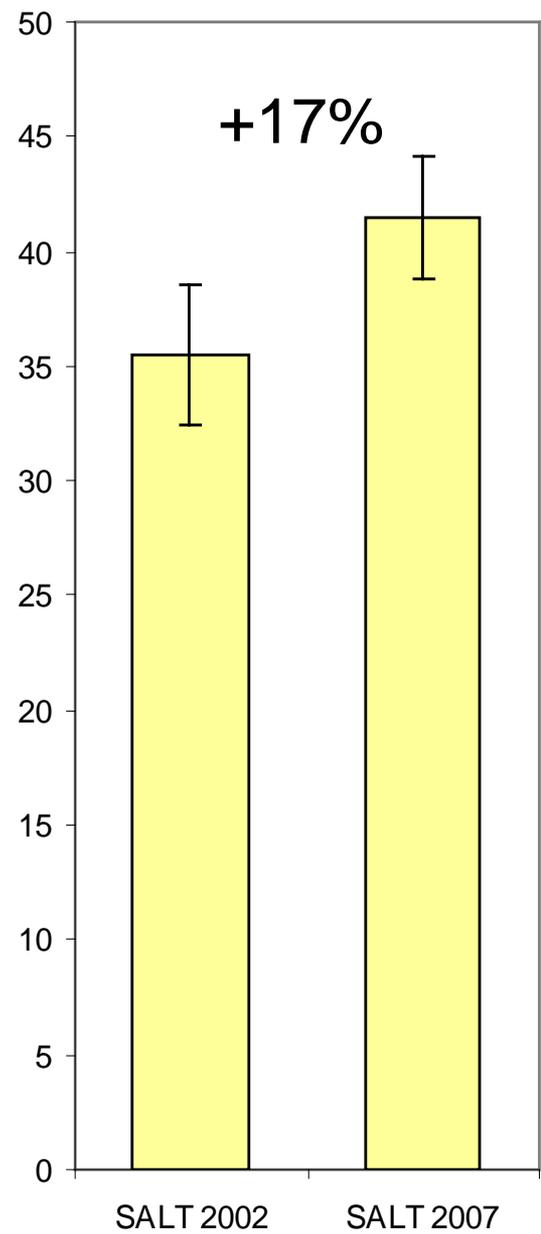
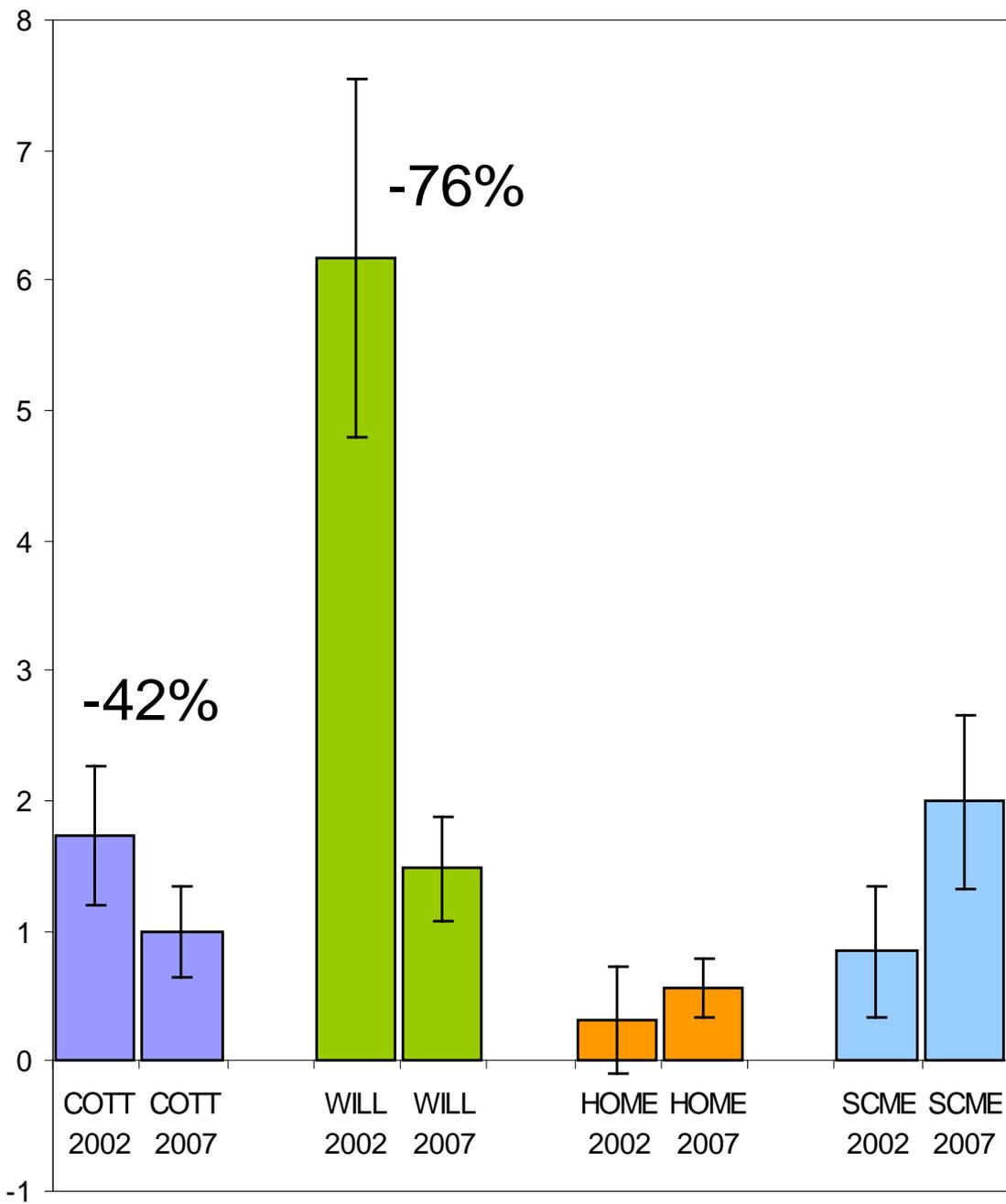
← August 30, 2004









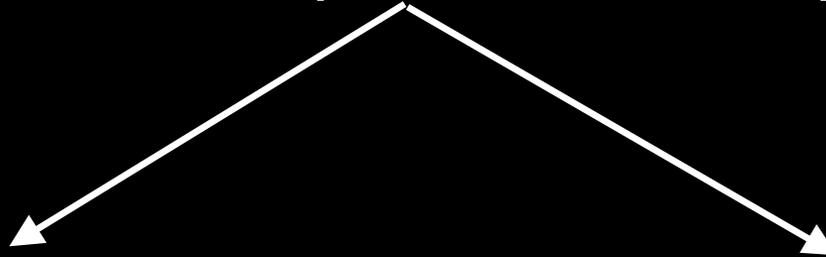


Changes in Colorado River Mexico, 2002-2007 In Summary

Drought: drastic reduction of flows



Reduction in riparian habitat quality



Population
decline of
riparian-related
birds

Population
increase of
agricultural-related
birds



Changes in Colorado River Mexico

But, some resiliency
despite absence of
surface flows

Still remnant
populations of
riparian birds

Agricultural run-off
and sub-surface
flows

Changes in Colorado River Mexico, 2002-2007

What next?

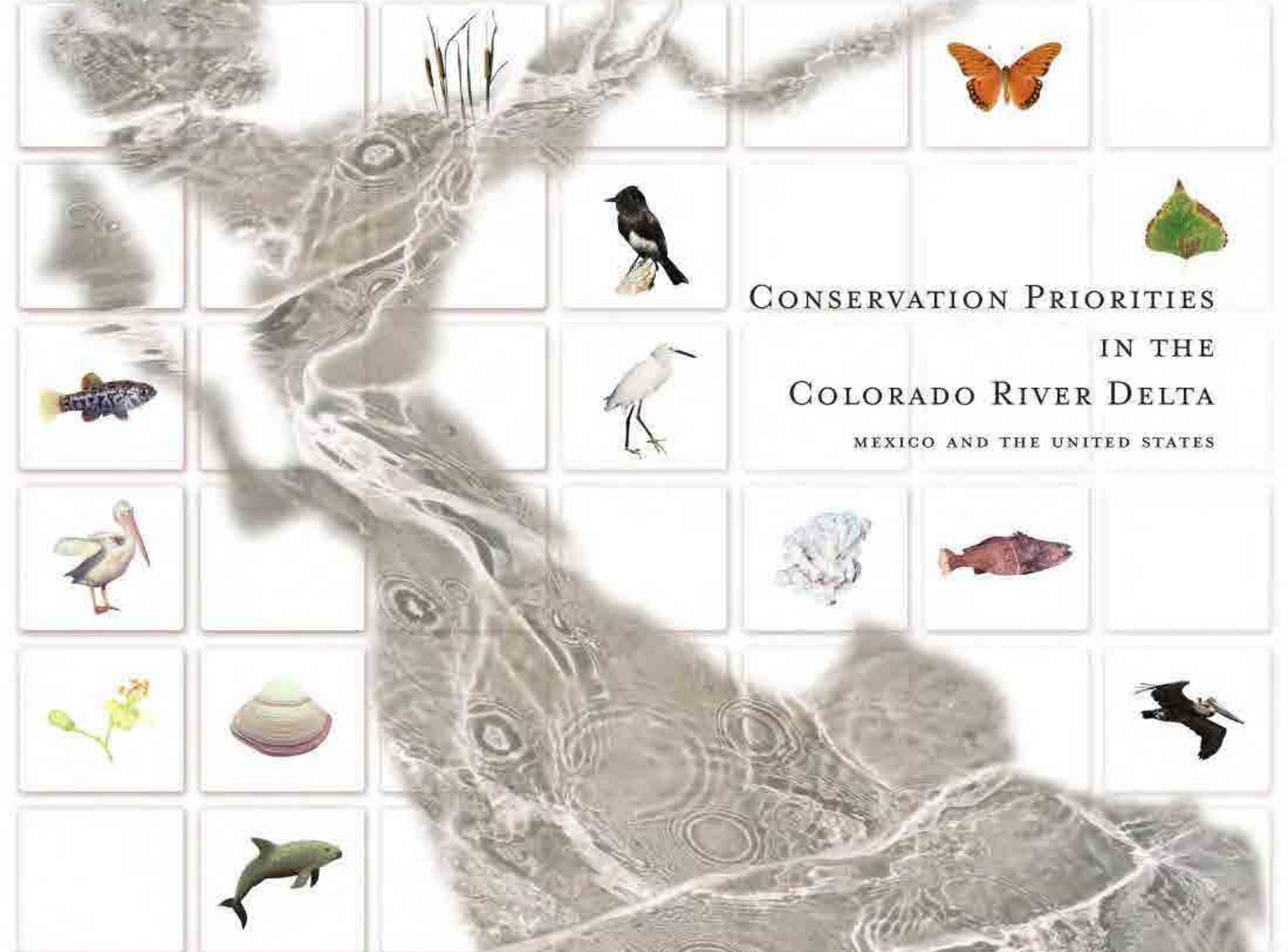
Low reservoir conditions and climate change: drought might continue and deteriorate river conditions

Risk for riparian birds in the Colorado River in Mexico

We are working to revert the trends, through riparian restoration and allocation of instream flows

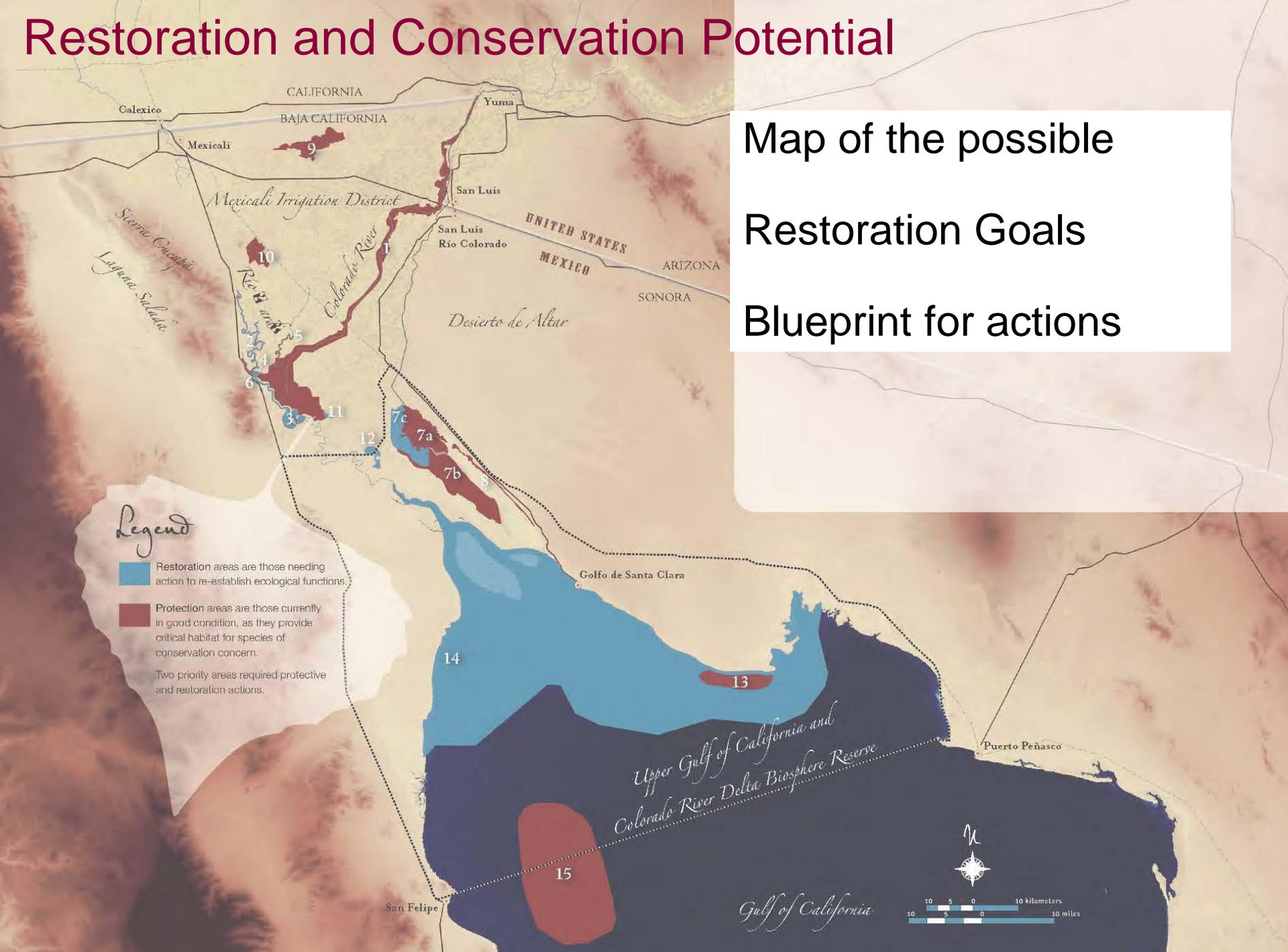


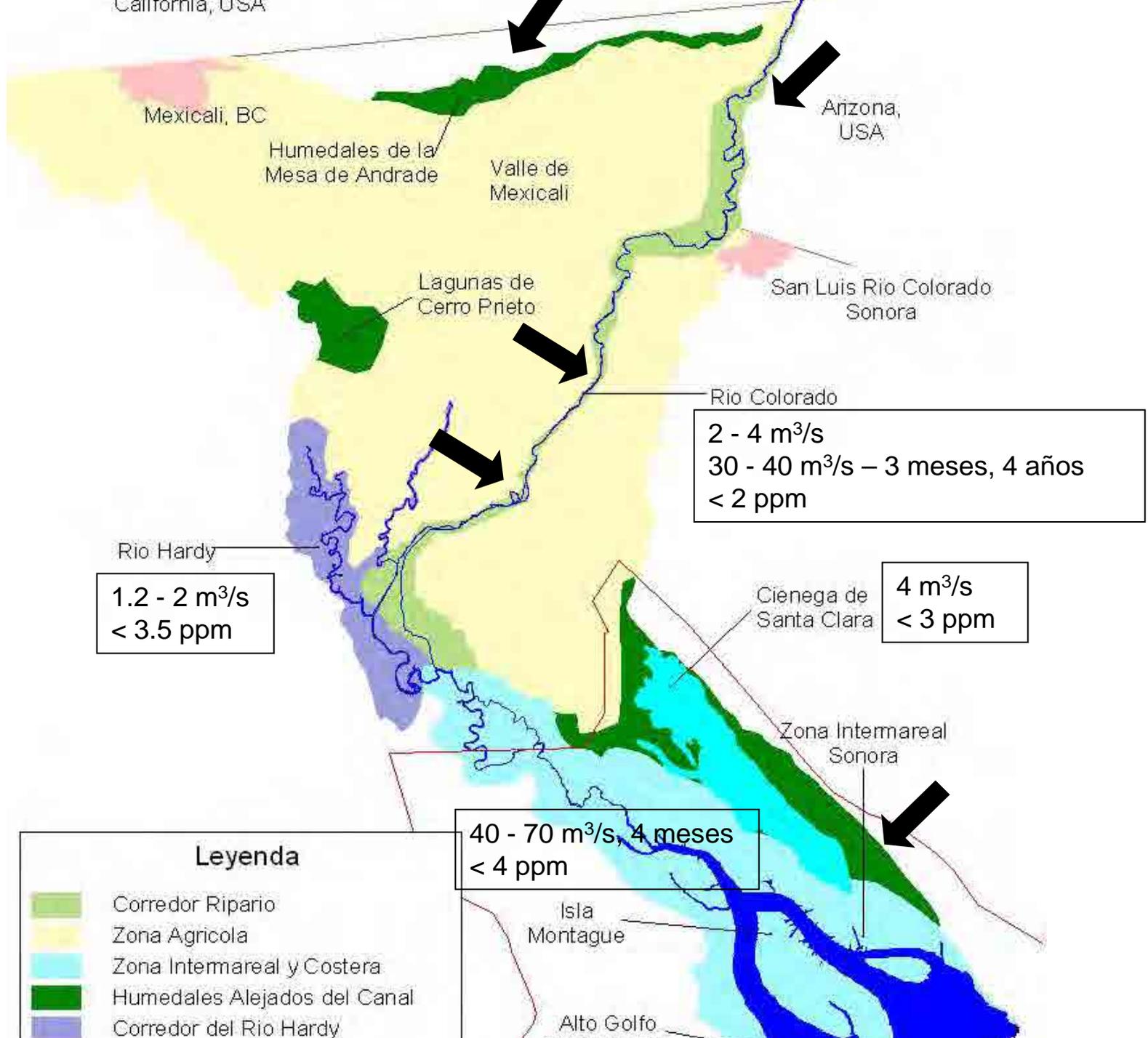
CONSERVATION PRIORITIES
IN THE
COLORADO RIVER DELTA
MEXICO AND THE UNITED STATES



Restoration and Conservation Potential

Map of the possible
Restoration Goals
Blueprint for actions





1.2 - 2 m³/s
< 3.5 ppm

2 - 4 m³/s
30 - 40 m³/s – 3 meses, 4 años
< 2 ppm

4 m³/s
< 3 ppm

40 - 70 m³/s, 4 meses
< 4 ppm

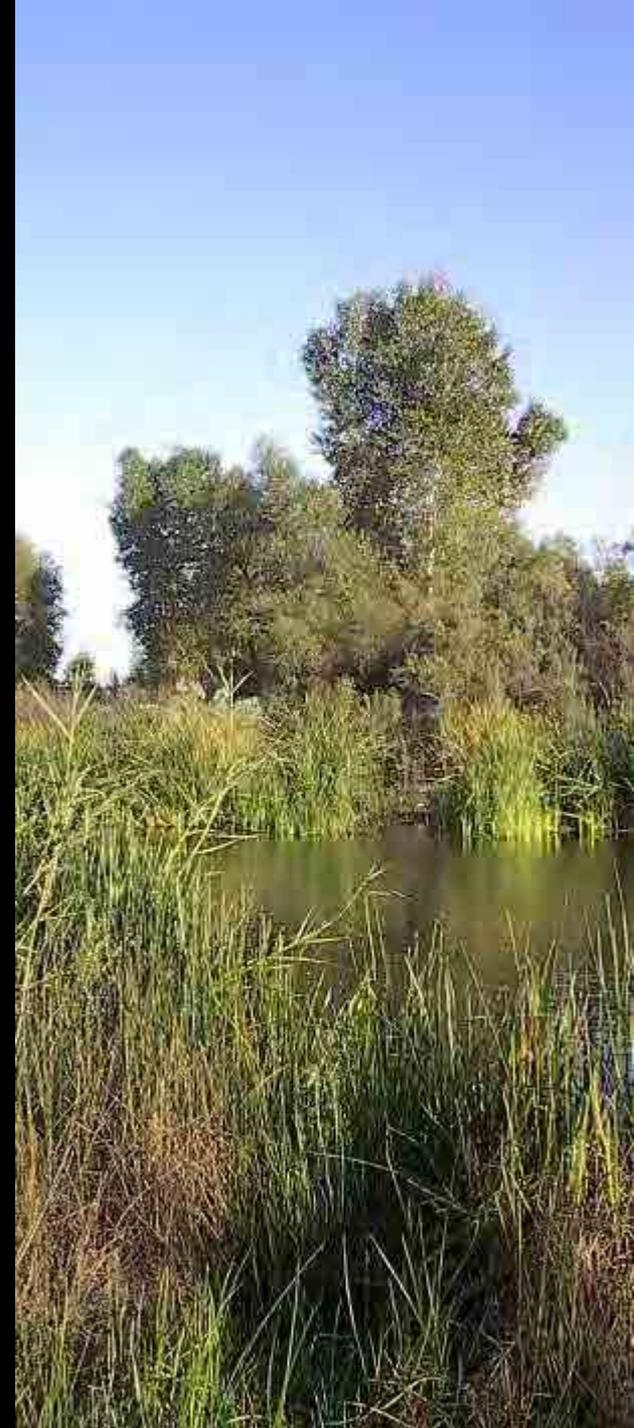
Leyenda

- Corredor Ripario
- Zona Agricola
- Zona Intermareal y Costera
- Humedales Alejados del Canal
- Corredor del Rio Hardy

Initiative for the Restoration of the Colorado River Delta

Improve and maintain environmental conditions at priority sites

- Biodiversity
- Community livelihoods
- Water use efficiency



Key strategies

- **Outreach and community involvement**
- **Binational negotiations**
- **Water for the environment**
- **Protection of key sites**
- **Restoration**



Public Policy and Binational Negotiations

- Creation of the Biosphere Reserve and Ramsar Sites
- Minute 306 of the International Water Treaty: binational collaboration for the restoration of the delta.
- Integration of the Binational Colorado River Cooperative Process within the framework of CILA/IBWC
 - Environment
 - Participation of multiple stakeholders

Implementation Water Allocation

- The river is over-allocated
- We need new strategies and tools



Water Allocation:

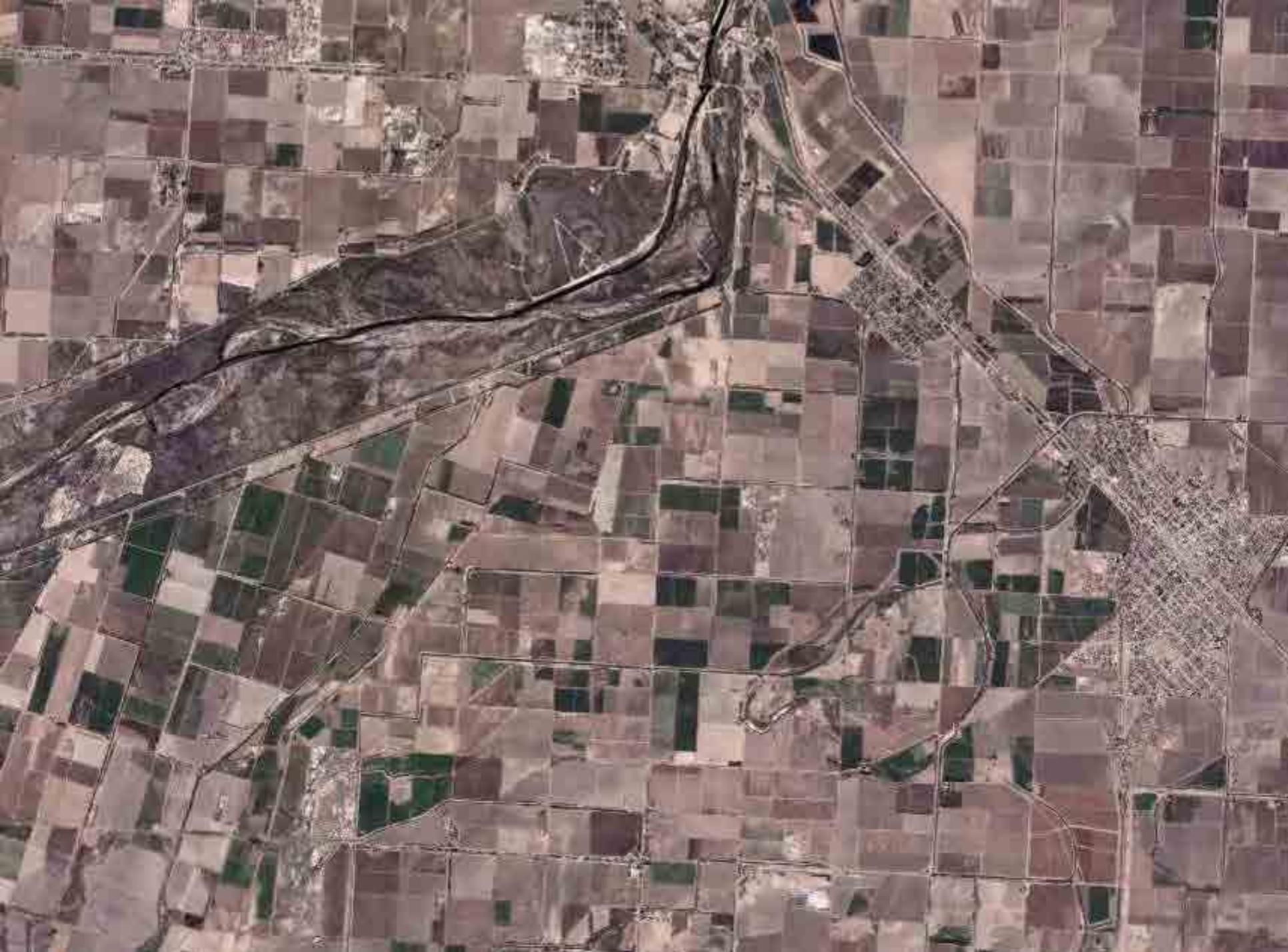
- Voluntary, market-based strategies
- Acquisition of water rights in the Mexicali Valley
- Water Trust for the Restoration of the Colorado River Delta

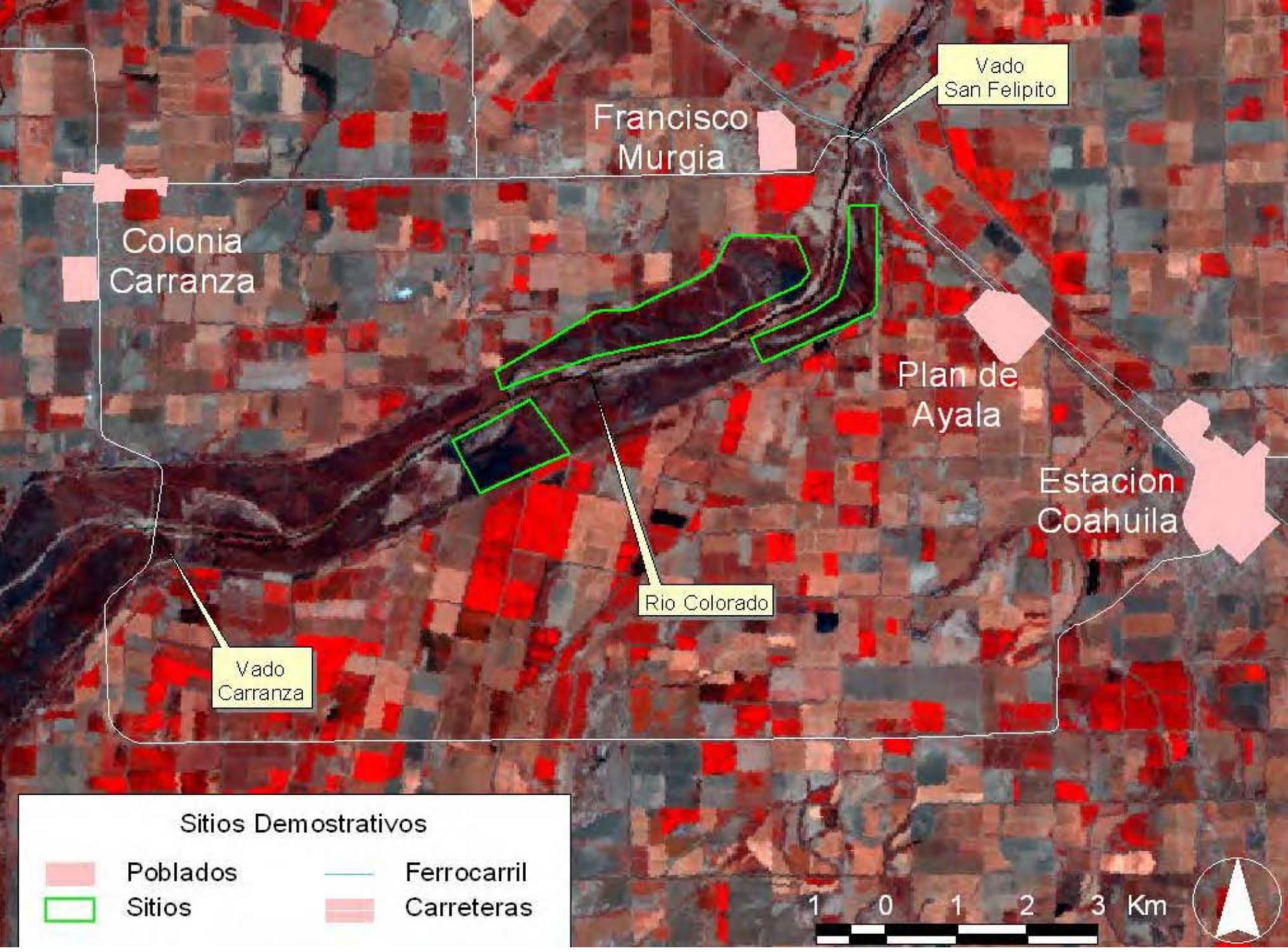


Water Allocation

- 1 ha of water rights = 10,000 m³/year (8.11 AFY)
- Permanent allocation
- Contract for transfer of water right
- Register in the Public Registry of Water Rights







Vado San Felipeito

Francisco Murgia

Colonia Carranza

Plan de Ayala

Estacion Coahuila

Vado Carranza

Rio Colorado

Sitios Demostrativos

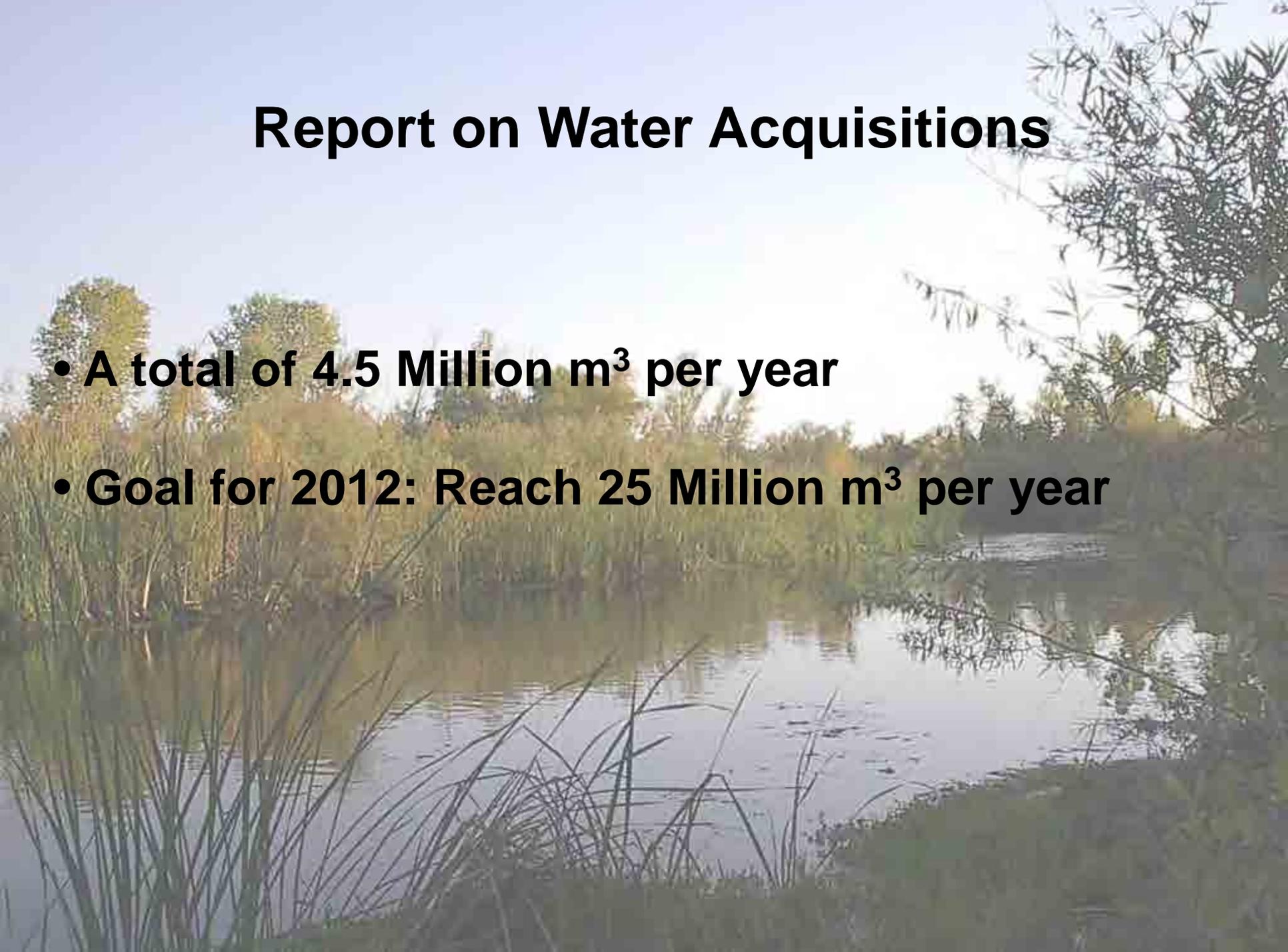
-  Poblados
-  Sitios
-  Ferrocarril
-  Carreteras

1 0 1 2 3 Km





Report on Water Acquisitions

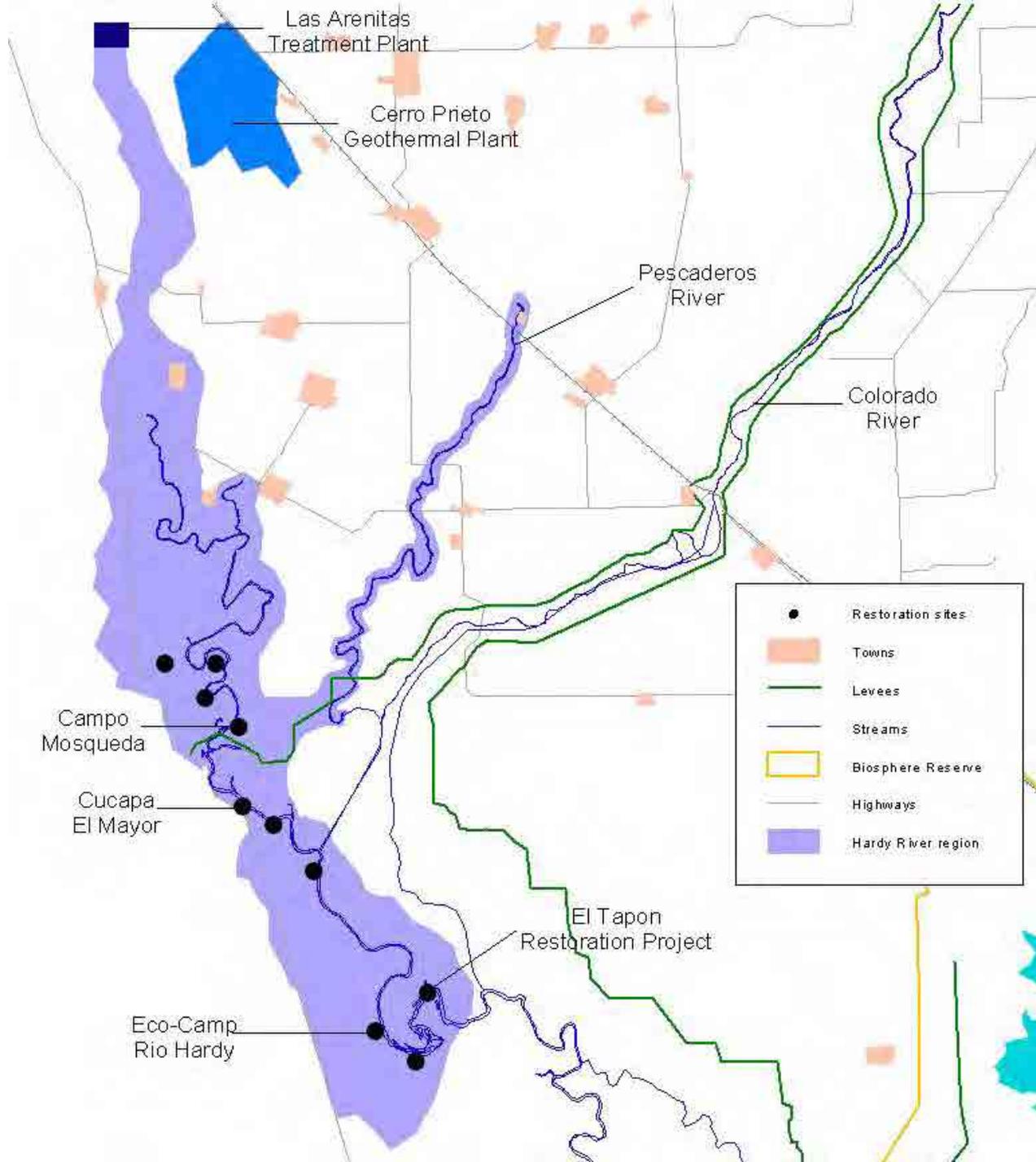
A scenic view of a pond or lake surrounded by tall reeds and trees, with a clear blue sky above. The water is calm, reflecting the surrounding greenery and the sky. The reeds in the foreground are tall and thin, some leaning over the water. The trees in the background are lush and green, suggesting a healthy ecosystem.

- **A total of 4.5 Million m³ per year**
- **Goal for 2012: Reach 25 Million m³ per year**

Las Arenitas Wastewater Treatment Plant

30% of the effluent guaranteed for instream flows in the Hardy River (700 l/s or 22 Mm³ per year)

Duplicates the flow in the river

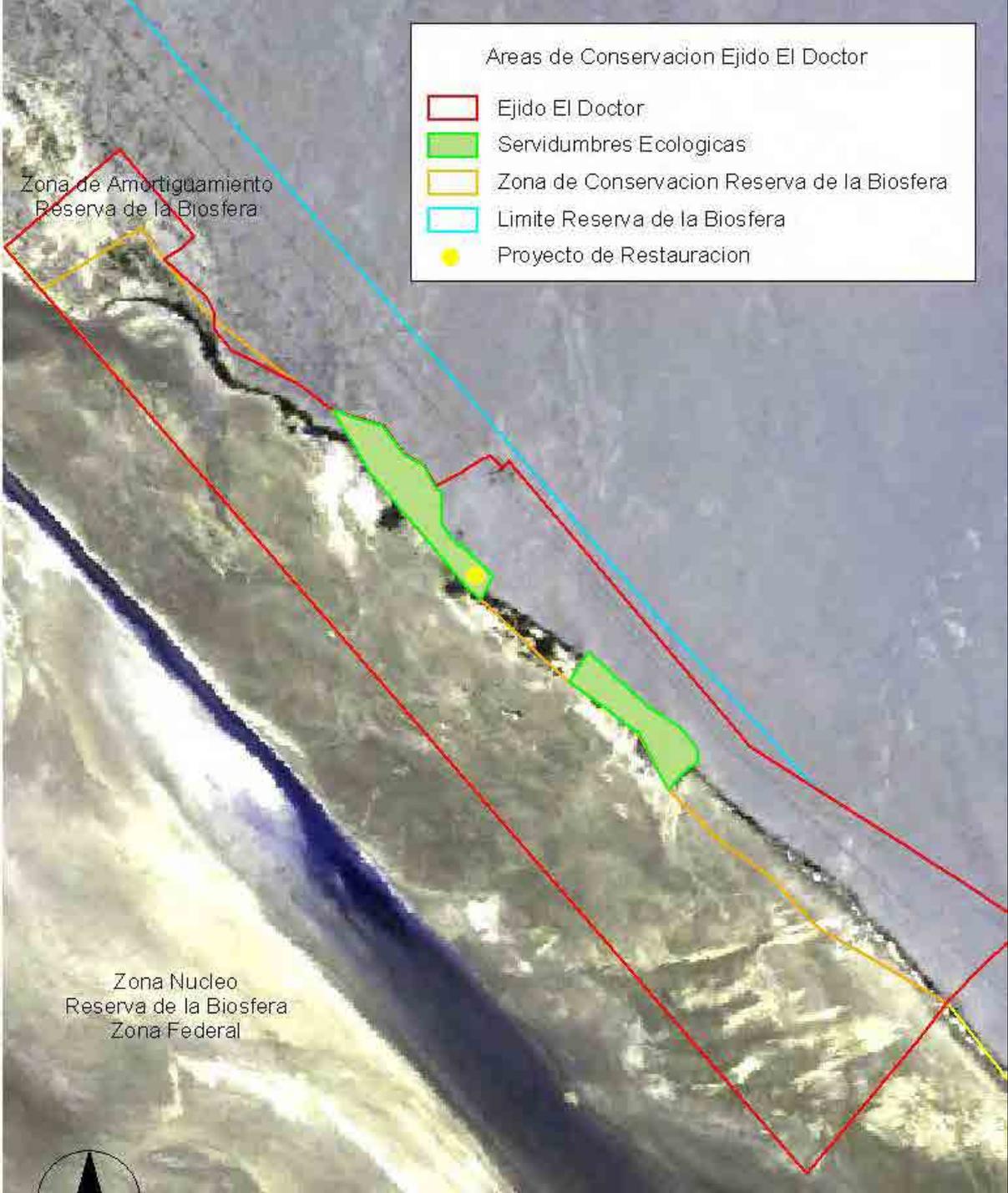












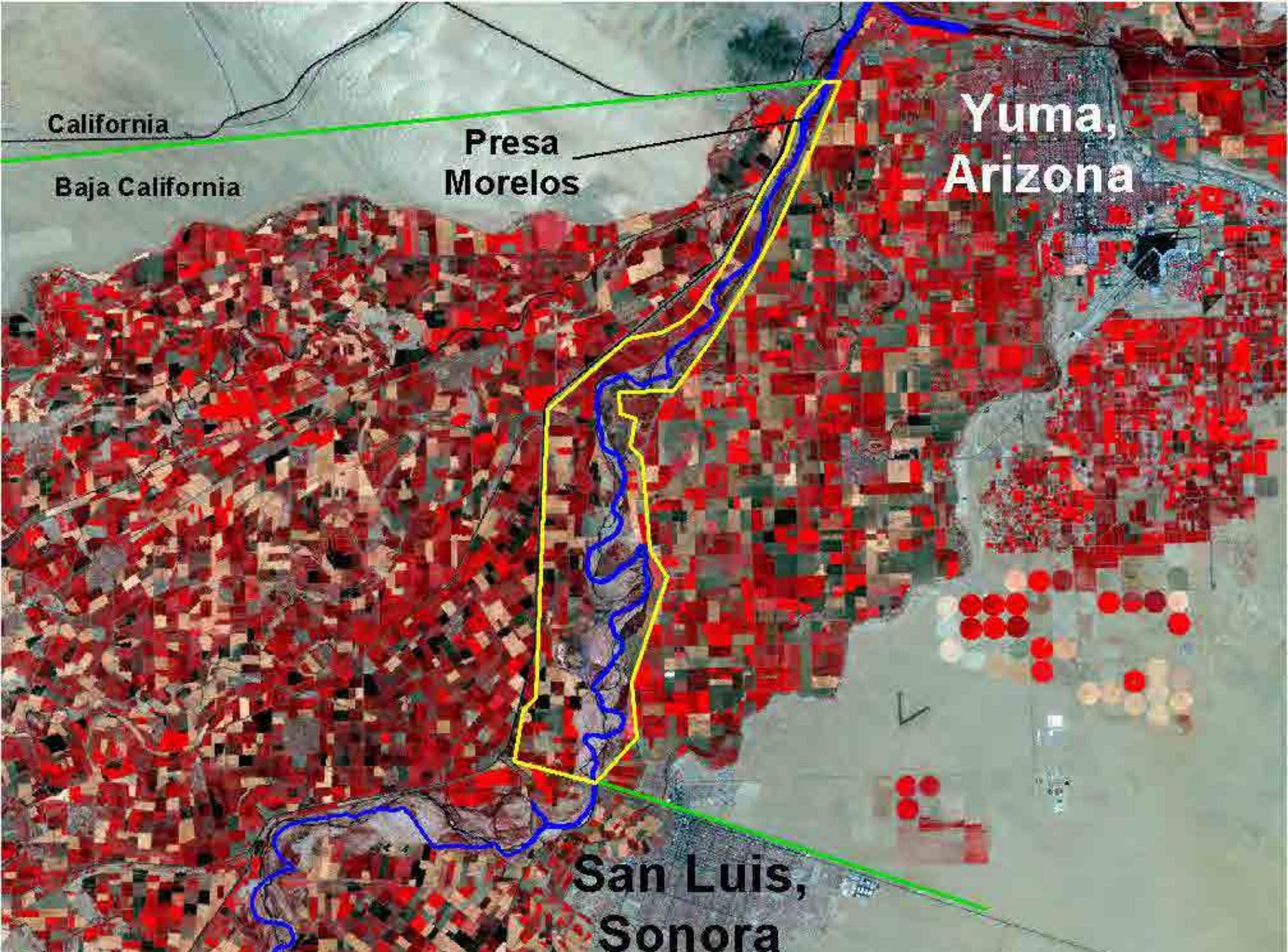
Conservation Easements and Concessions

1,400 Ha

El Doctor
Ejido Johnson







California

Baja California

Presa
Morelos

Yuma,
Arizona

San Luis,
Sonora



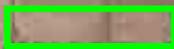
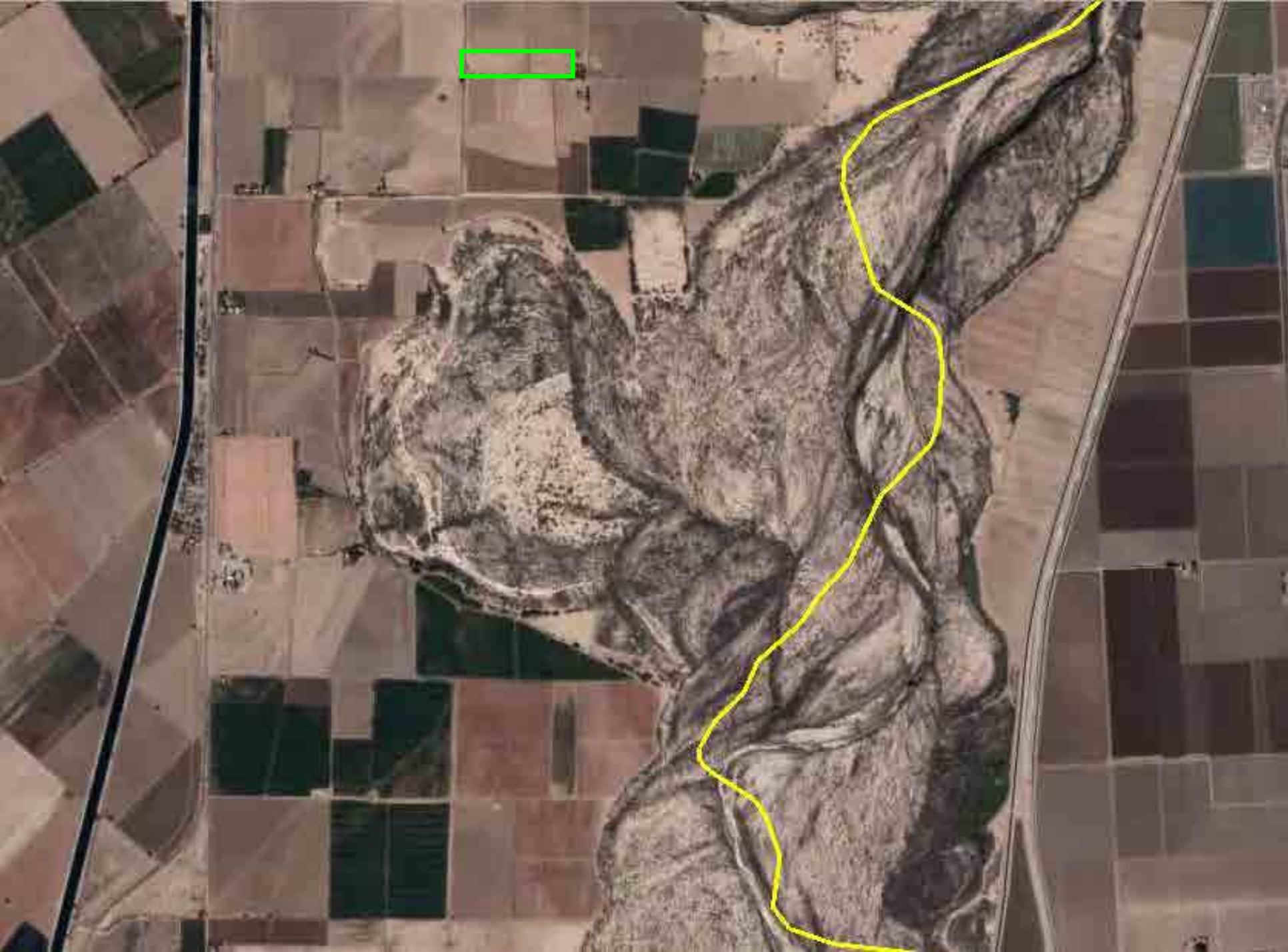
Restoration in the Limitrophe Section

Binational Effort – Local Roots Recovery of the Colorado River

Benefits for the community:

- Recovery of natural spaces
- Sustainable rural development
- Improve safety in border communities





Legend / Leyenda

-  Marsh / Marisma
-  Dryland (Upland) Vegetation / Restauración de Zonas Áridas (Terrenos Altos)
-  Cottonwood / Willow Vegetation / Reforestación con Sauces y Álamos
-  Mesquite Vegetation / Reforestación con Mesquite
-  Mexico & US Border- 1973 / Frontera México Y USA- 1973
-  Cleared Public Safety & Flood Control / Zona Limpia para la Seguridad Pública y el Control de Inundaciones
-  Open Water / Agua Superficial
60 Ft Channel / Canal de 60 Pies (18 metros)
-  Agriculture / Agricultura
-  Colorado River Miles / Millas del Río Colorado

Total Acres/ Total de Actes

Mexico Park Area: 27.0 Acres, 11.0 Hectares
 Área del Parque en México: 27.0 Actes, 11.0 Hectáreas

Total Open Water: 39.0 Acres, 15.8 Hectares
 Total de Agua Superficial: 39.0 Acres, 15.8 Hectáreas

Total 60 Ft Channel: 16,265 Linear Feet, 4,958 Linear Meters
 Total del Canal de 60 Pies (18 metros): 16,265 pies lineales, 4,958 metros lineales

Total Dryland (Upland) Vegetation: 560.0 Acres, 227.0 Hectares
 Total de Restauración de Zonas Áridas (Terrenos Altos): 560.0 Acres, 227.0 Hectáreas

Total Cleared Public Safety / Flood Control: 511.5 Acres, 207.0 Hectares
 Total de Zona Limpia para la Seguridad Pública y el Control de Inundaciones: 511.5 Acres, 207.0 Hectáreas

Total Marsh: 45.0 Acres, 18.2 Hectares
 Total de Marismas: 45.0 Acres, 18.2 Hectáreas

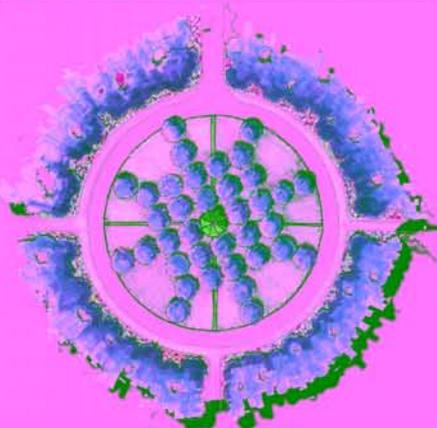
Total Mesquite Reforestation: 165.5 Acres, 67.0 Hectares
 Total de Reforestación con Mezquite: 165.5 Acres, 67.0 Hectáreas

Total Cottonwood / Willow Reforestation: 119.3 Acres, 48.3 Hectares
 Total de Reforestación con Sauces y Álamos: 119.3 Acres, 48.3 Hectáreas

Total Salgrass: 22.31 Acres, 9.0 Hectares
 Total de Pasto Salado: 22.31 Acres, 9.0 Hectáreas

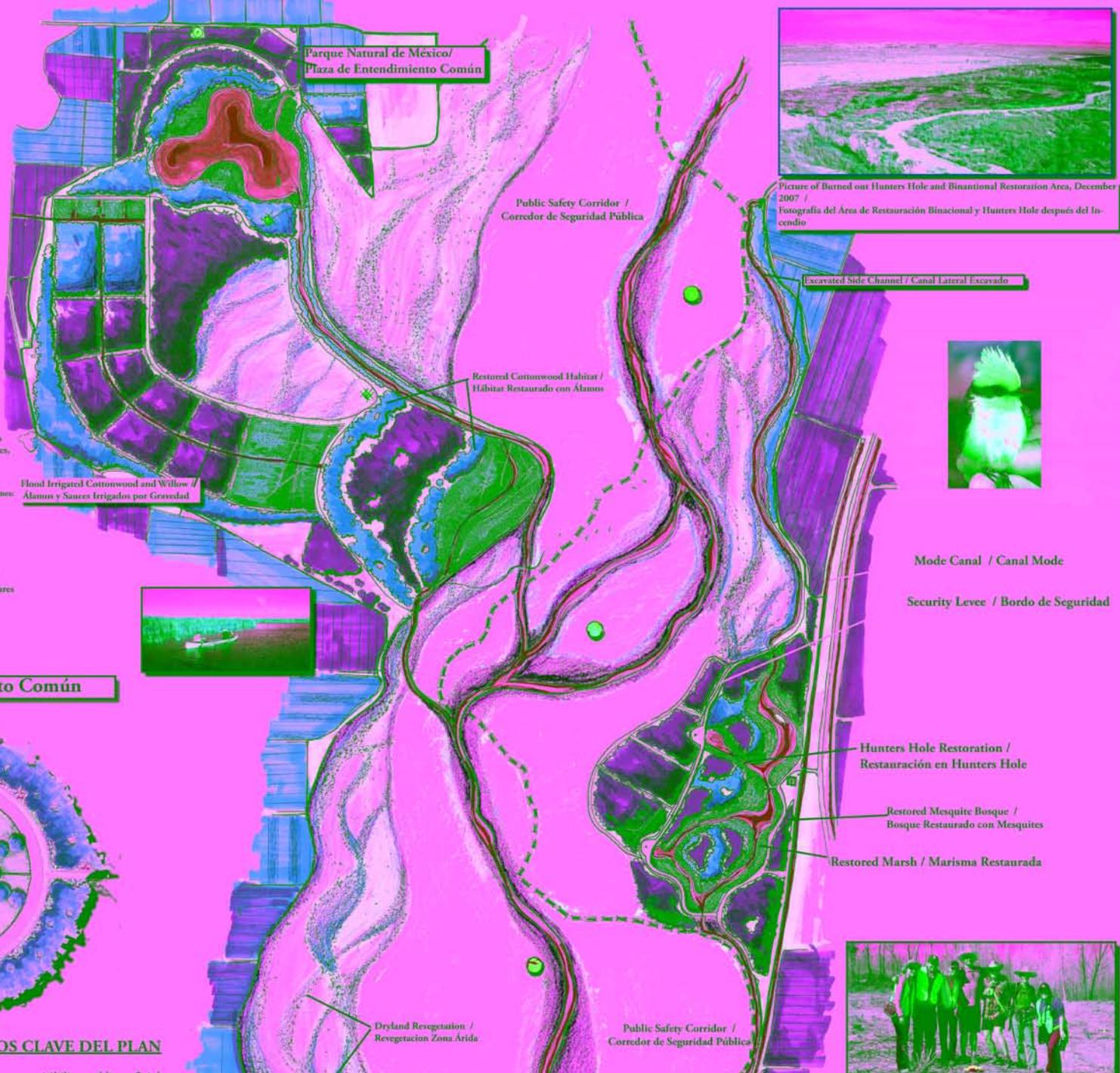
Total Riverbank Reforestation: 119.0 Acres, 48.2 Hectares
 Total de Reforestación Ribereña: 119.0 Acres, 48.2 Hectáreas

Plaza de Entendimiento Común



KEY FEATURES OF PLAN / ASPECTOS CLAVE DEL PLAN

1) Public Safety



Picture of Burned out Hunters Hole and Binational Restoration Area, December 2007 / Fotografía del Área de Restauración Binacional y Hunters Hole después del incendio



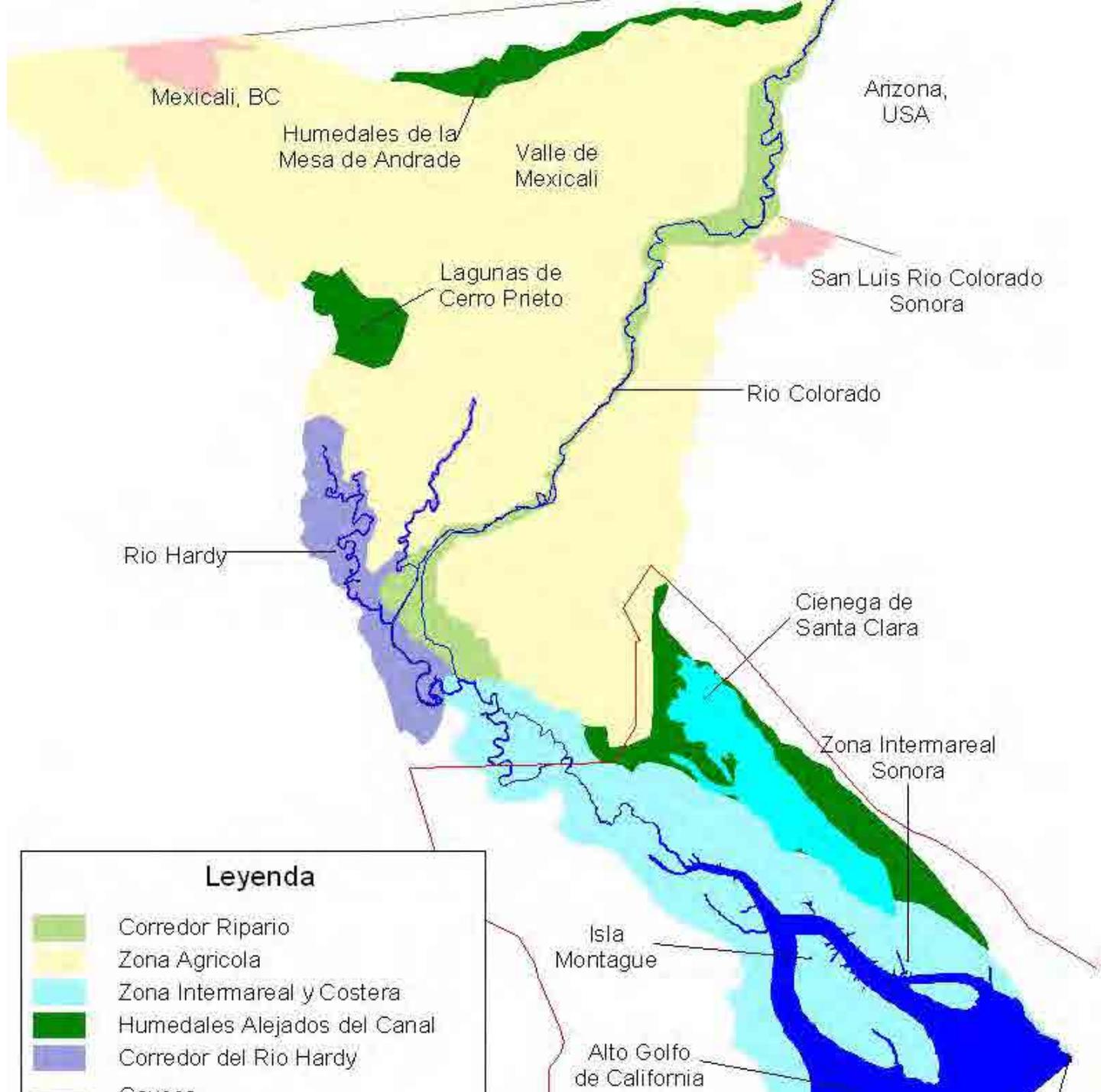












Mexicali, BC

Humedales de la
Mesa de Andrade

Valle de
Mexicali

Arizona,
USA

Lagunas de
Cerro Prieto

San Luis Rio Colorado
Sonora

Rio Colorado

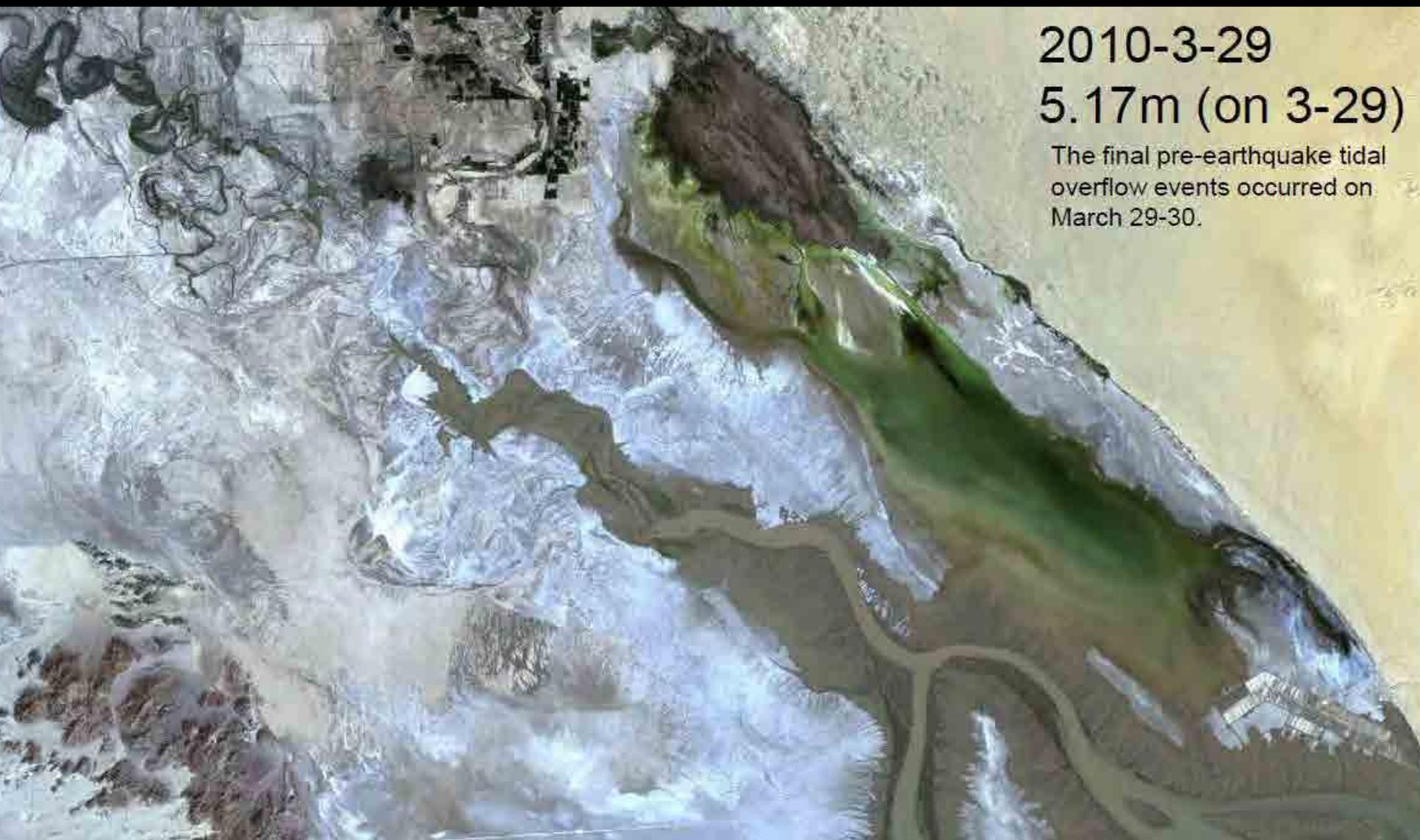
Rio Hardy

Ciénega de
Santa Clara

Zona Intermareal
Sonora

Isla
Montague

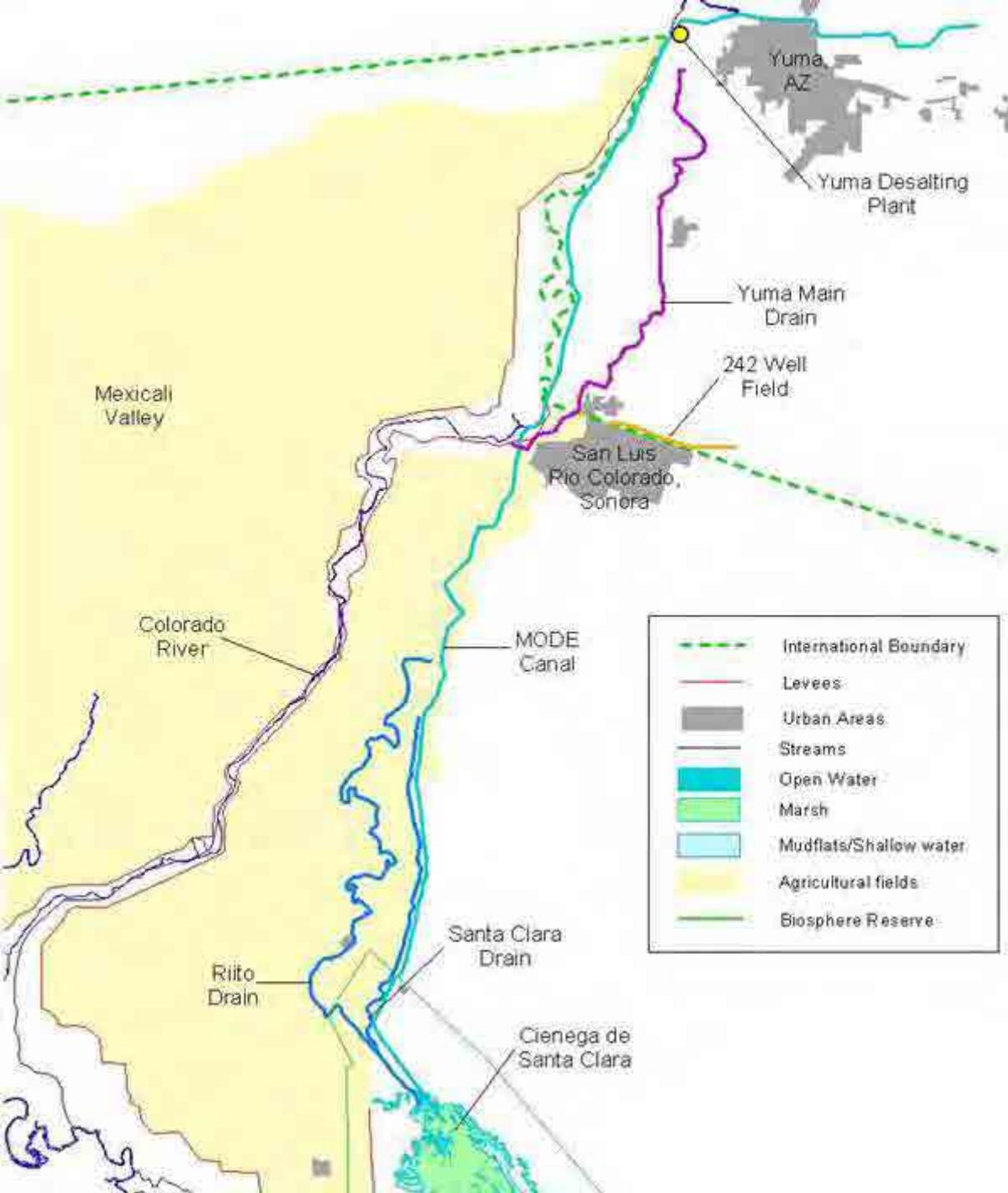
Alto Golfo
de California



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





695000

700000

705000

710000



Image date 10/3/1973
Scene time 10:43
High Tide 12:42MST +0.50 m
Time Difference +2:01

1973

3550000

3550000

3545000

3545000

3540000

3540000

1 2 3



Kilometers

695000

700000

705000

710000

695000

700000

705000

710000



Image date	10/1/1977
Scene time	10:06
High Tide	15:28 MST +1.46 m
Time Difference	+5:22

1977

3550000

3550000

3545000

3545000

3540000

3540000



Kilometers

695000

700000

705000

710000

695000

700000

705000

710000



Image date 8/23/1981
Scene time 10:29
High Tide 10:34 MST 1.34 m
Time Difference +00:05

1981

3550000

3550000

3545000

3545000

3540000

3540000



Kilometers

695000

700000

705000

710000

695000

700000

705000

710000



Image date 10/2/1985
Scene time 17:39
High Tide 15:04 MST +1.89m
Time Difference -2:35

1985

3550000

3550000

3545000

3545000

3540000

3540000



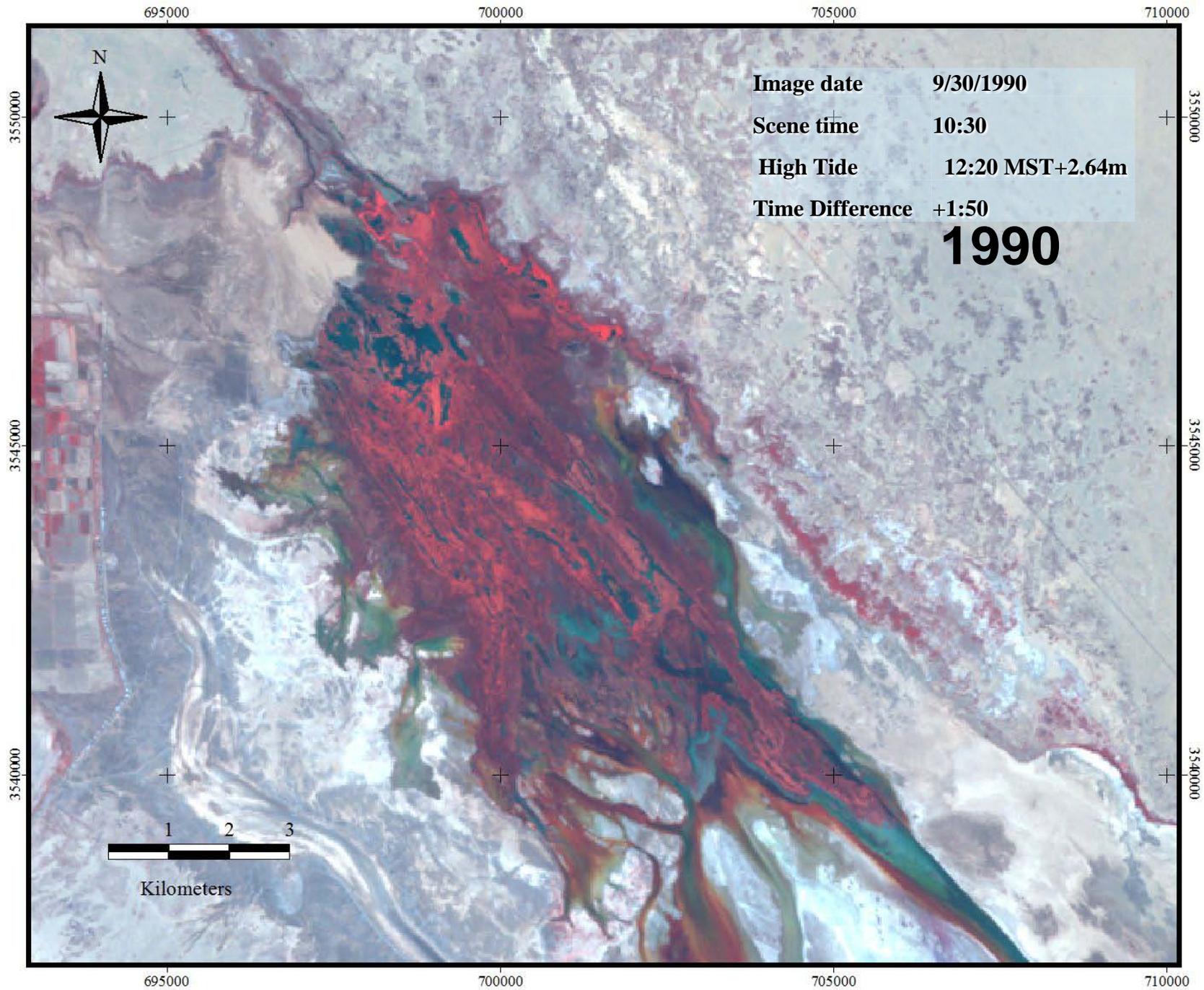
Kilometers

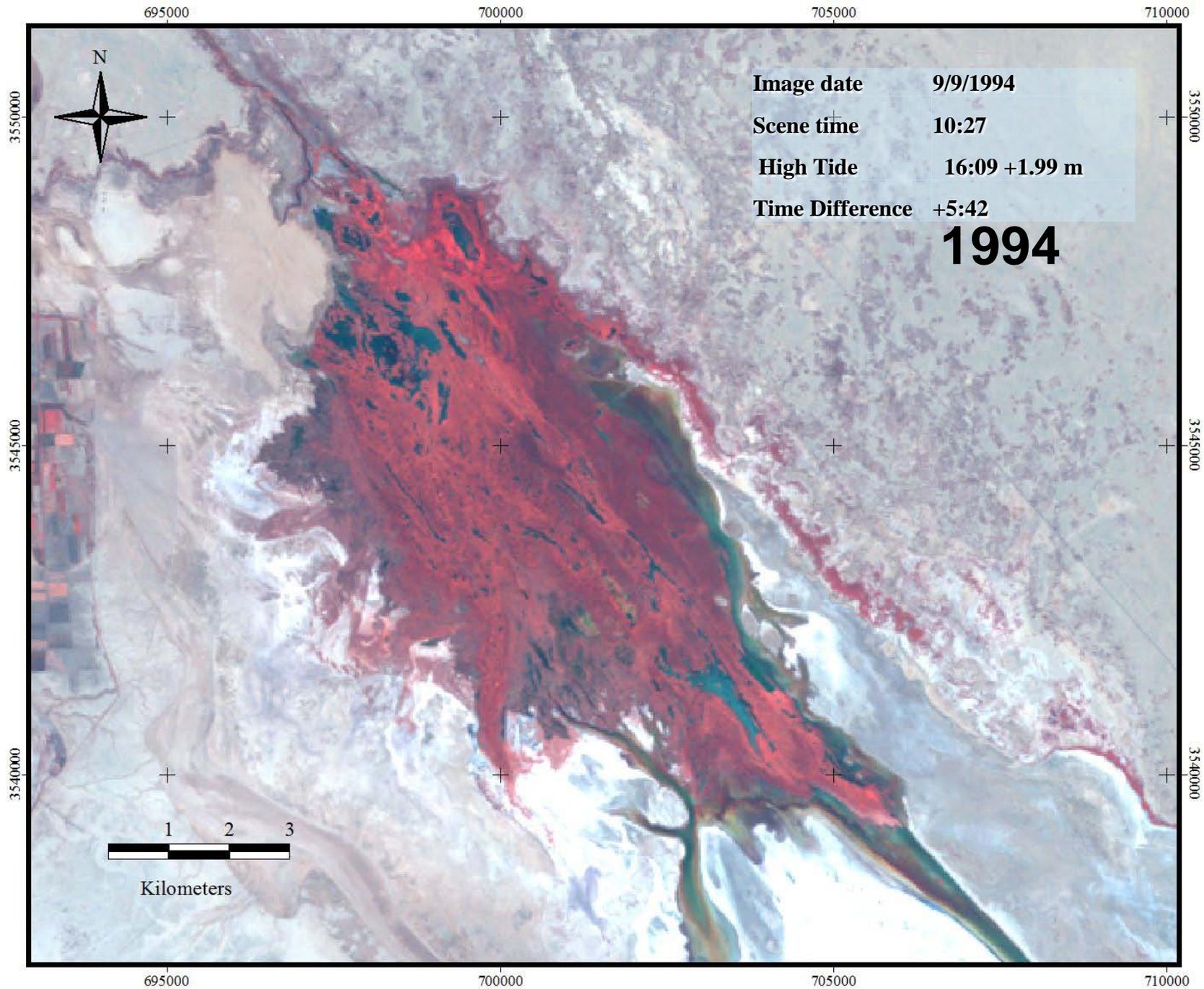
695000

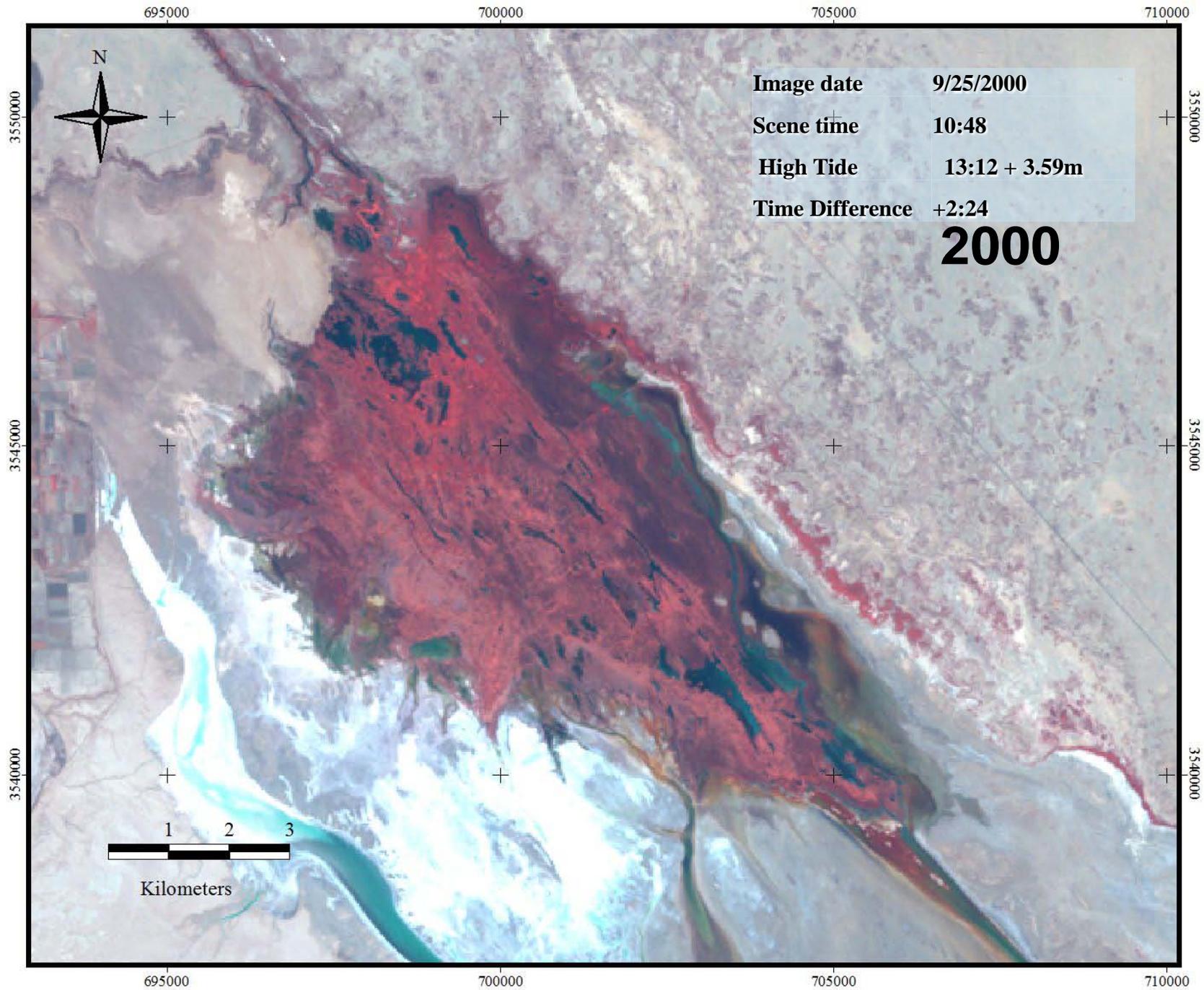
700000

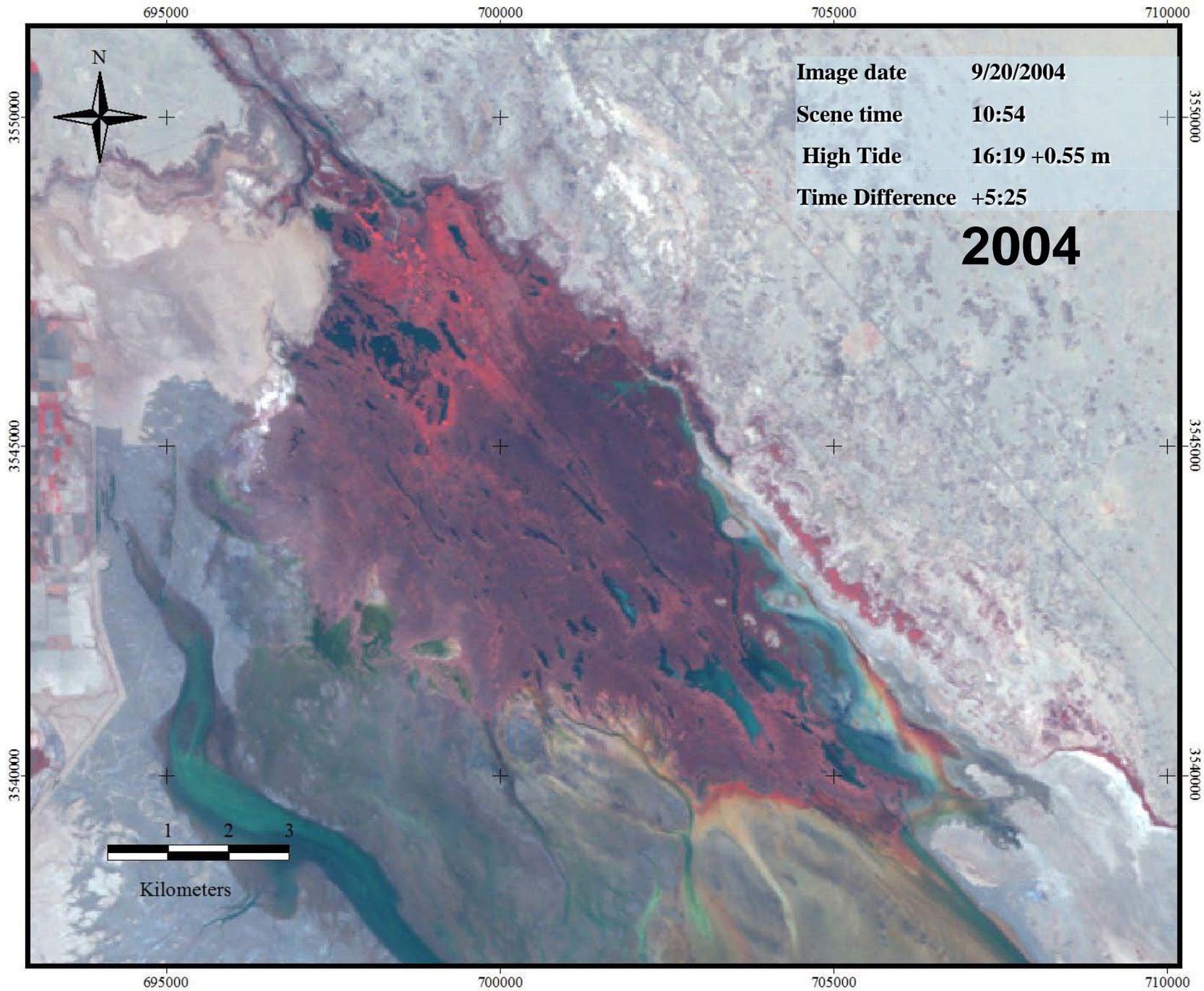
705000

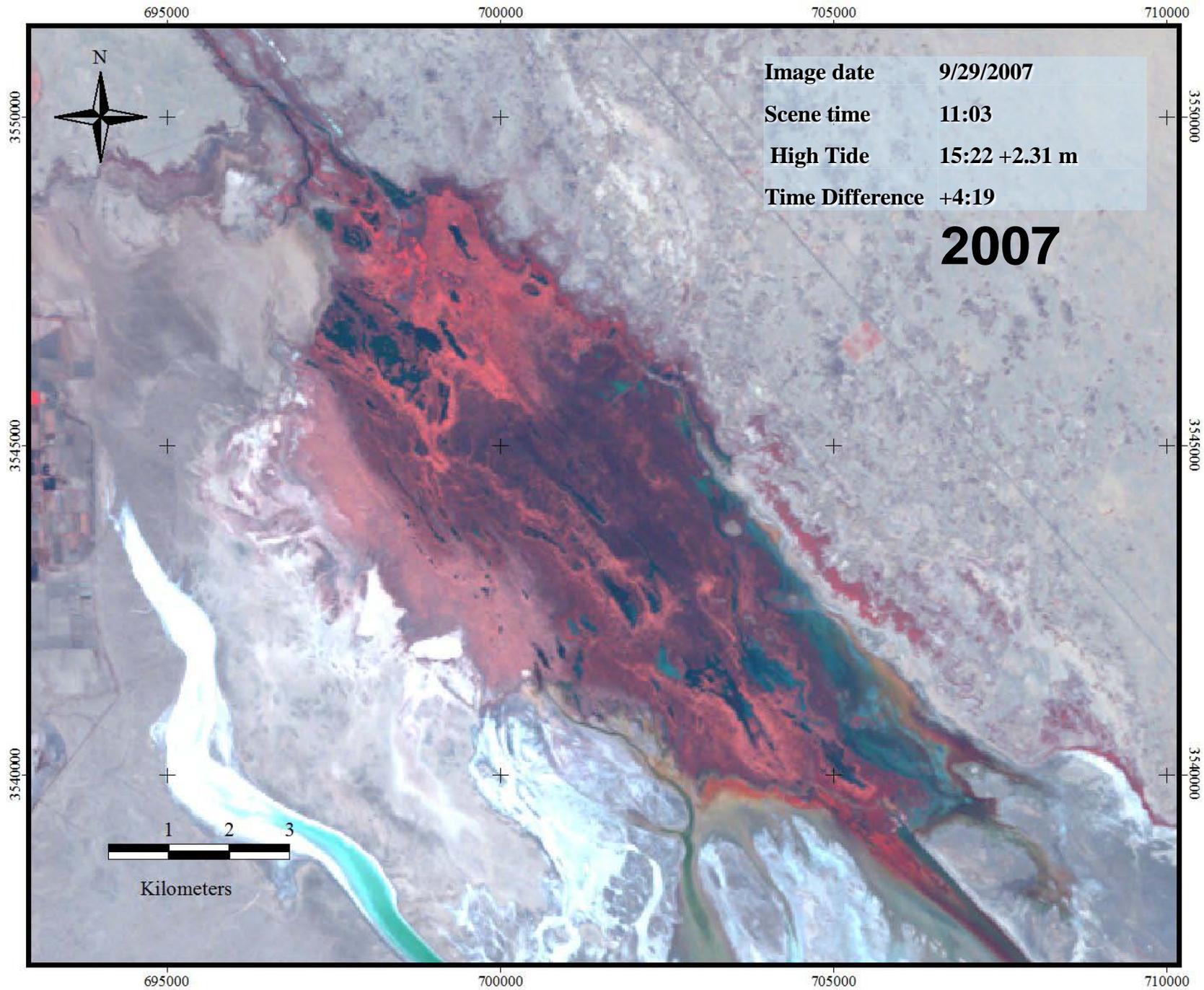
710000

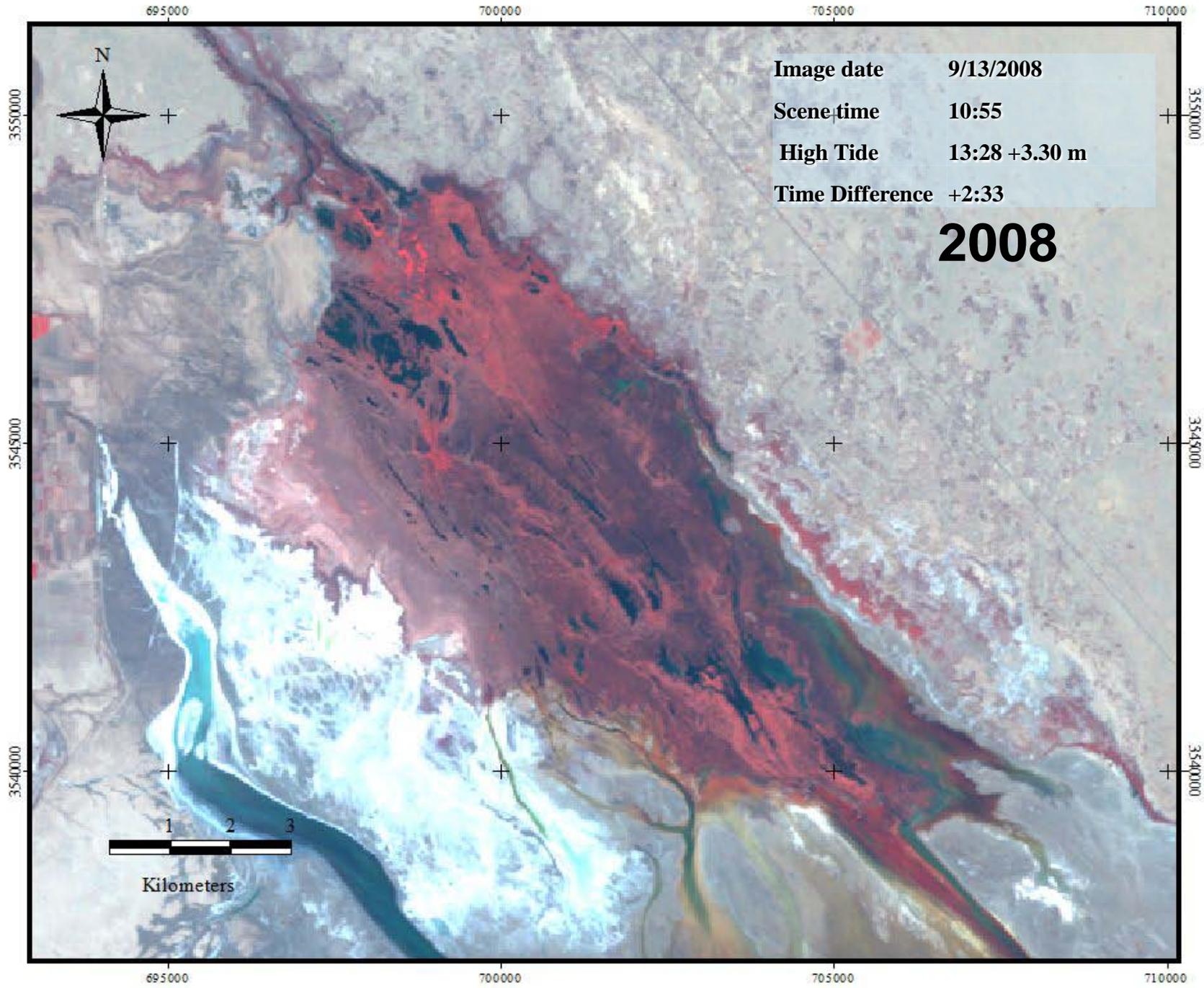


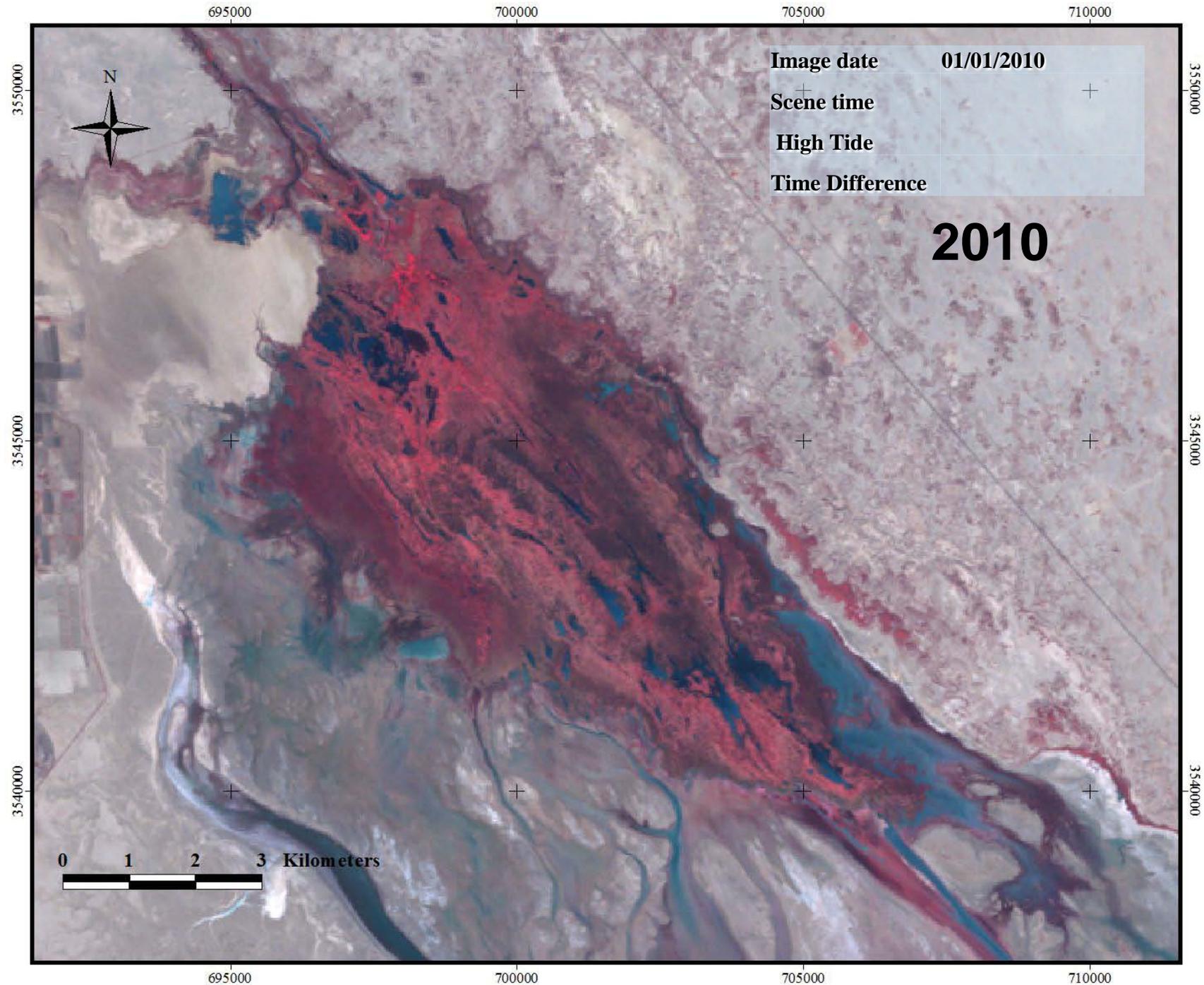












Ciénega de Santa Clara and Yuma Desalting Plant

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

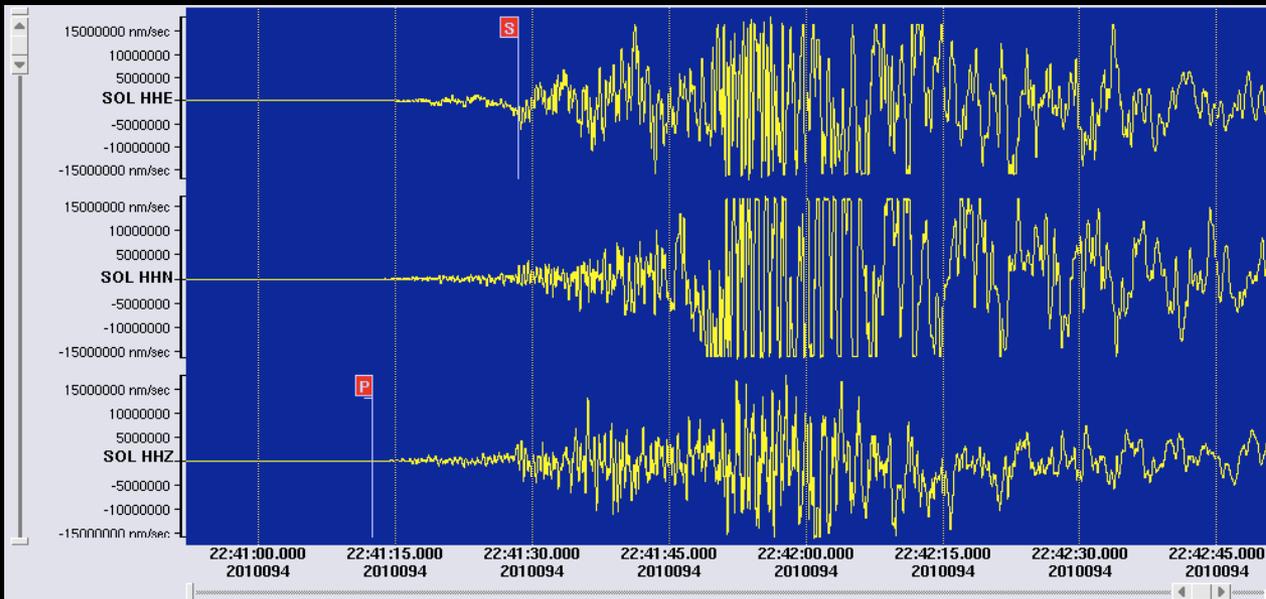
First time in which both countries dedicate water for the environment in the delta, and the first time that environmental groups are part of the Treaty

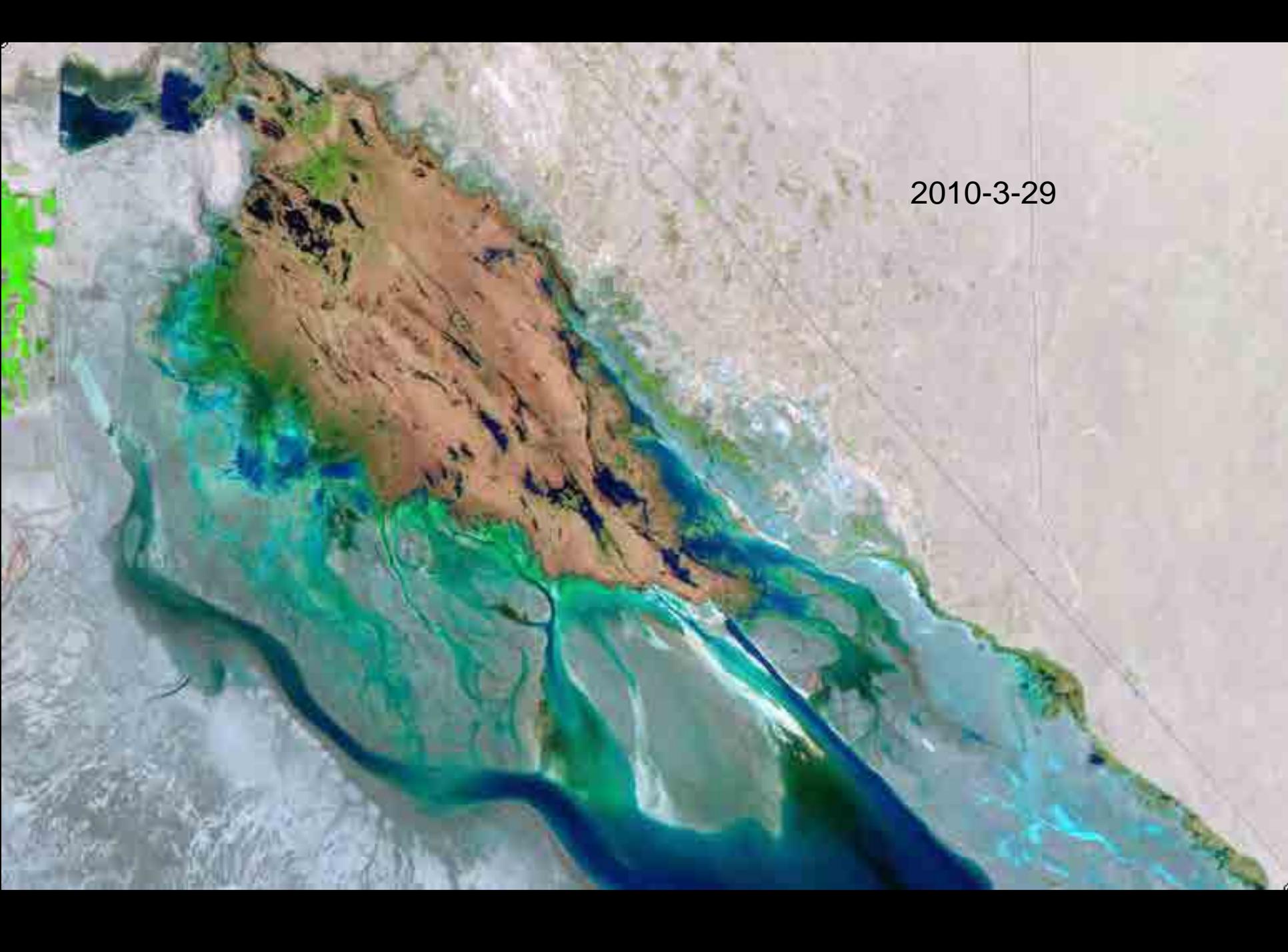
Comprehensive binational monitoring program

Binational Monitoring Program for the Ciénega de Santa Clara

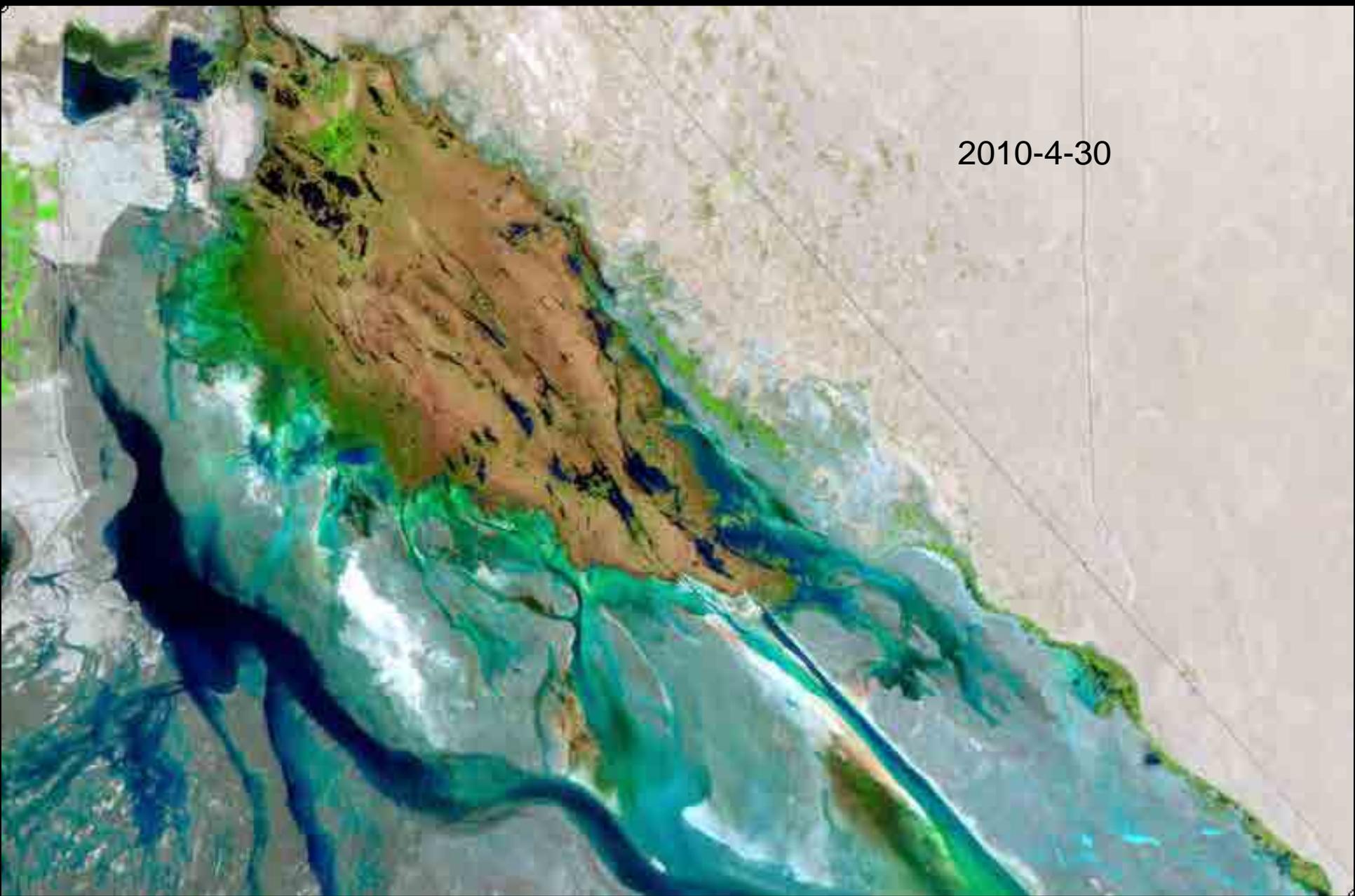


7.2 M El Mayor–Cucapah Earthquake, 3:40 PM, April 4, 2010



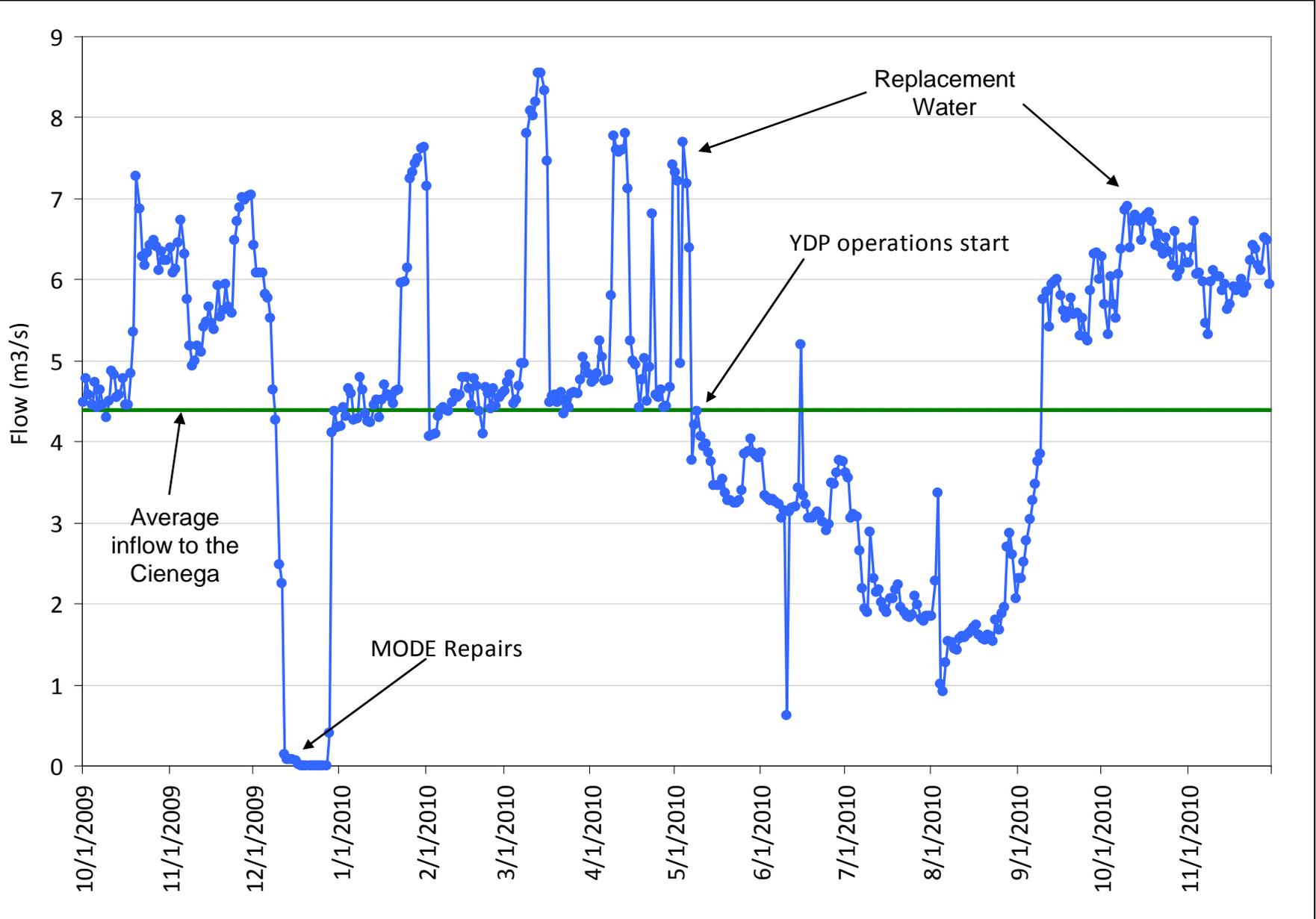


2010-3-29



2010-4-30

Inflows to the Ciénega de Santa Clara



Before the YDP trial run



YDP operations begin







2010-7-19

Effect of 30% flow reduction



Replacement water arriving

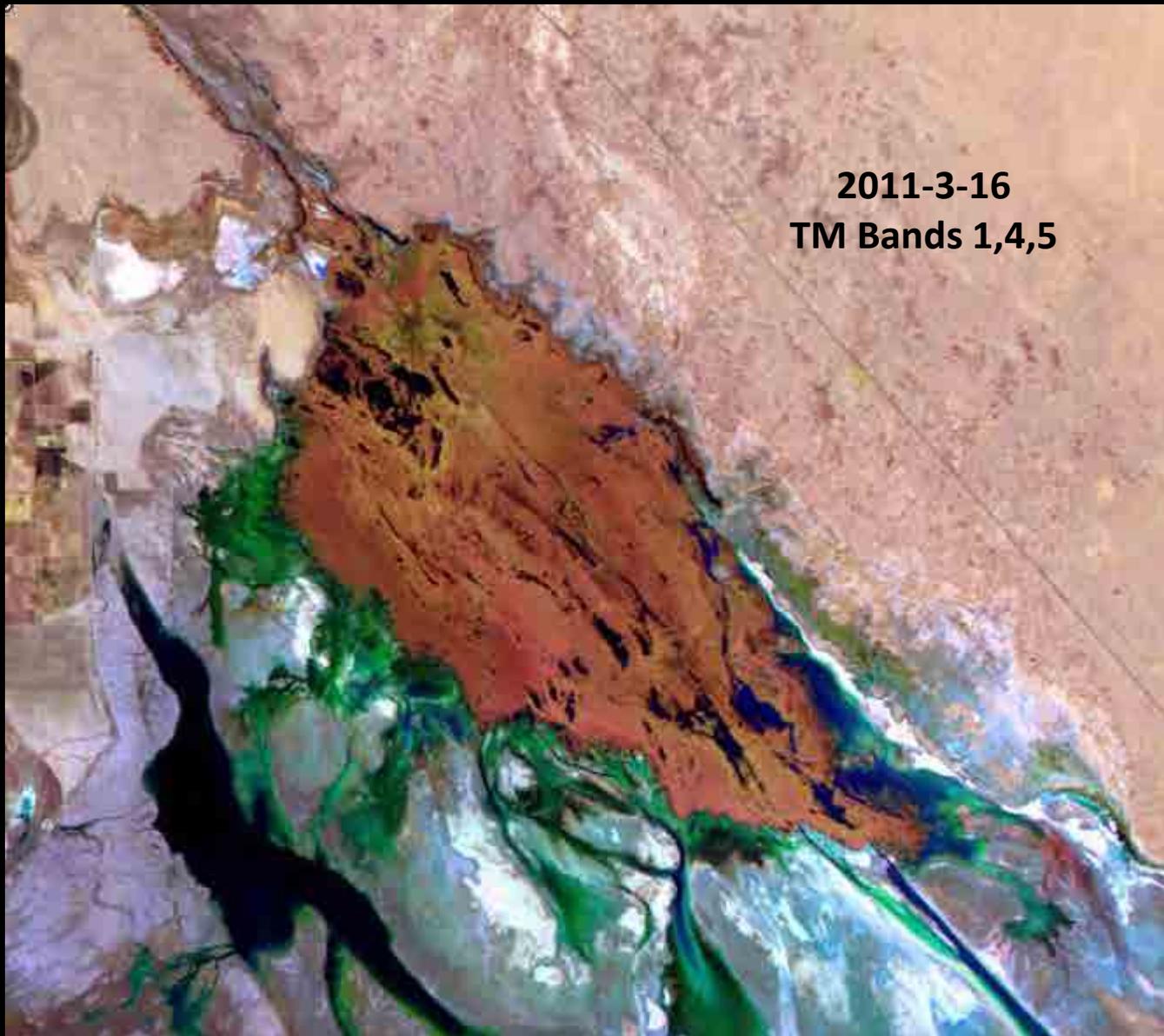




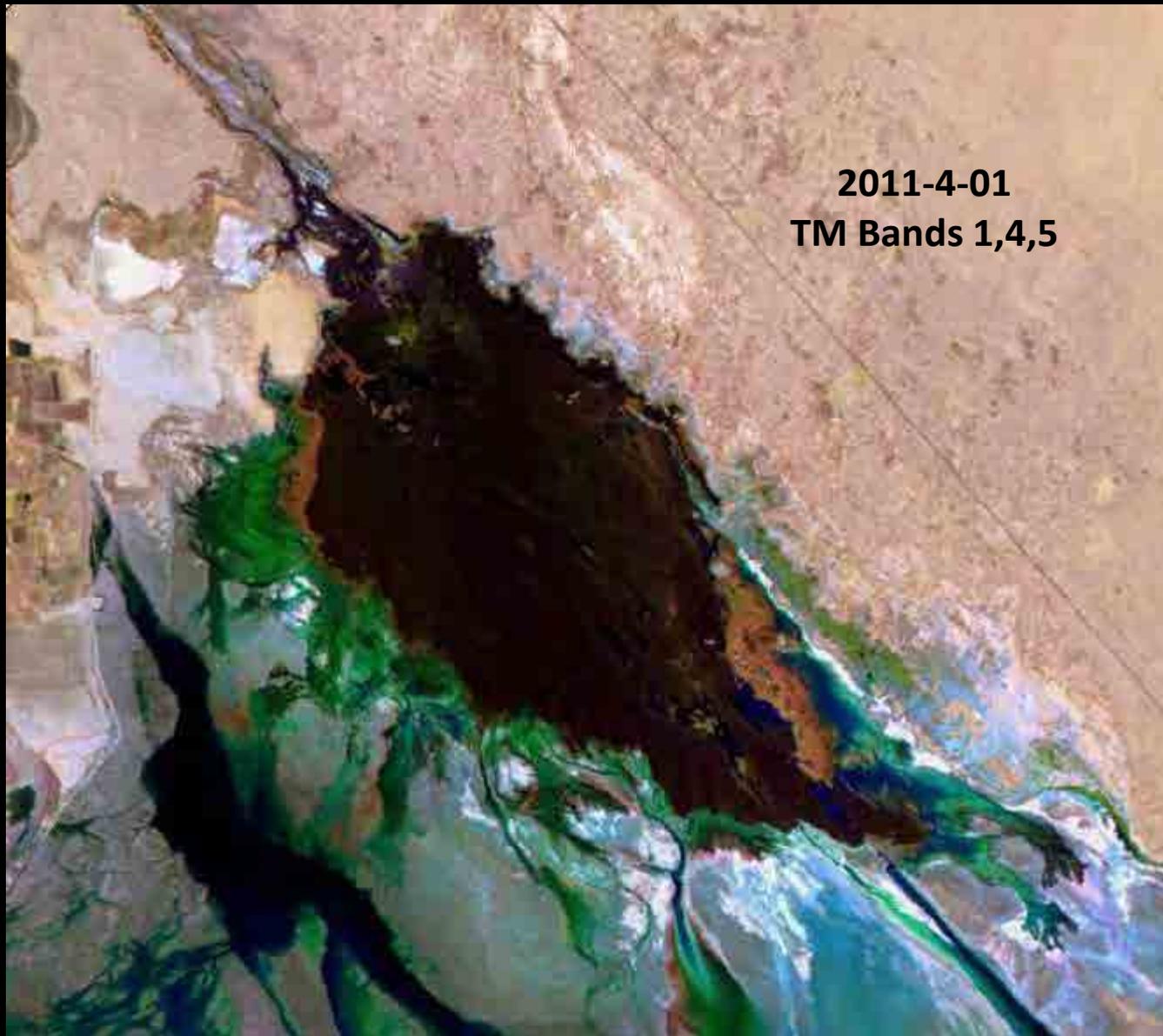


March 24, 2011. Images by Salvador Chavez, Pronatura

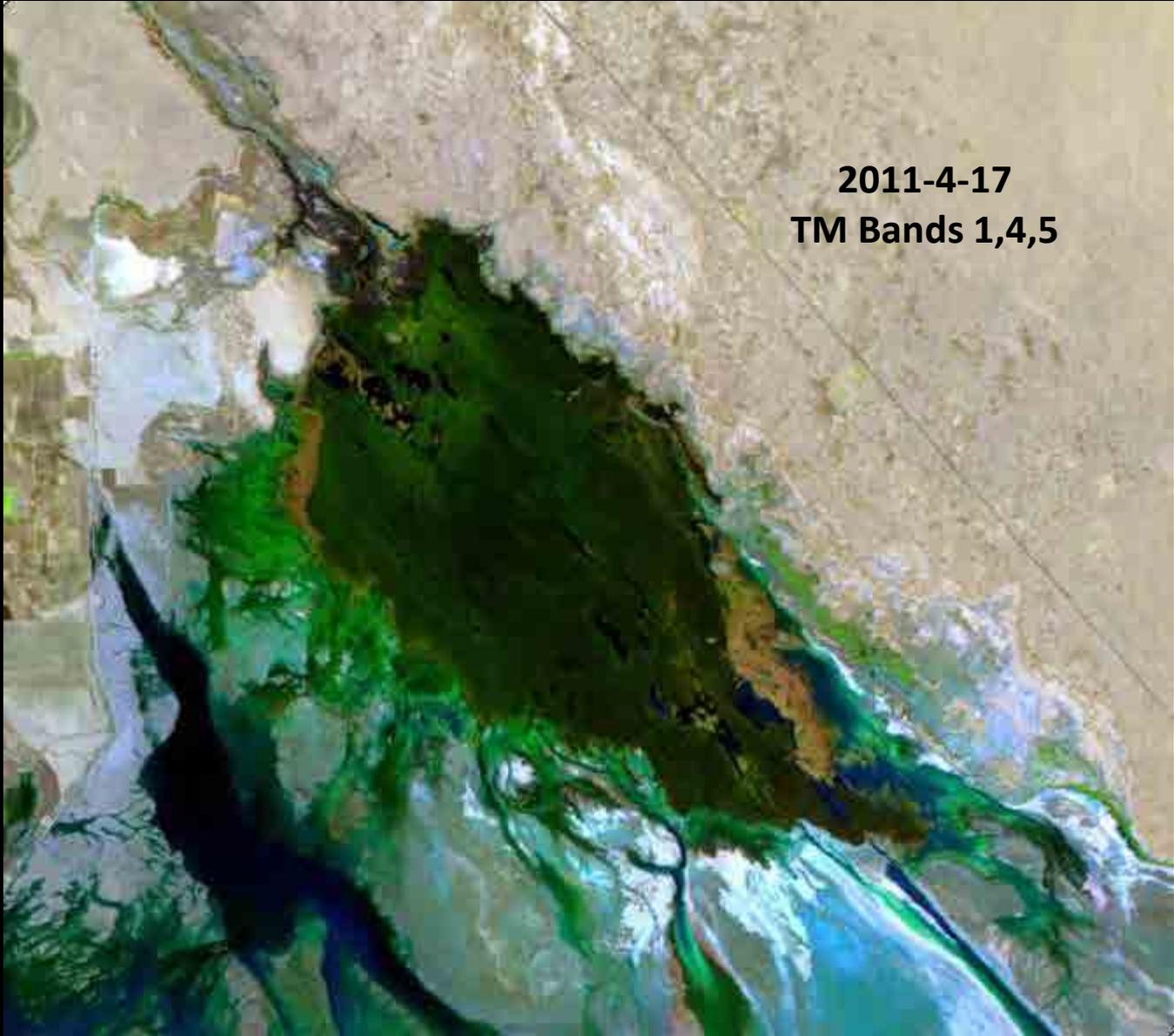




2011-3-16
TM Bands 1,4,5



2011-4-01
TM Bands 1,4,5



2011-4-17
TM Bands 1,4,5

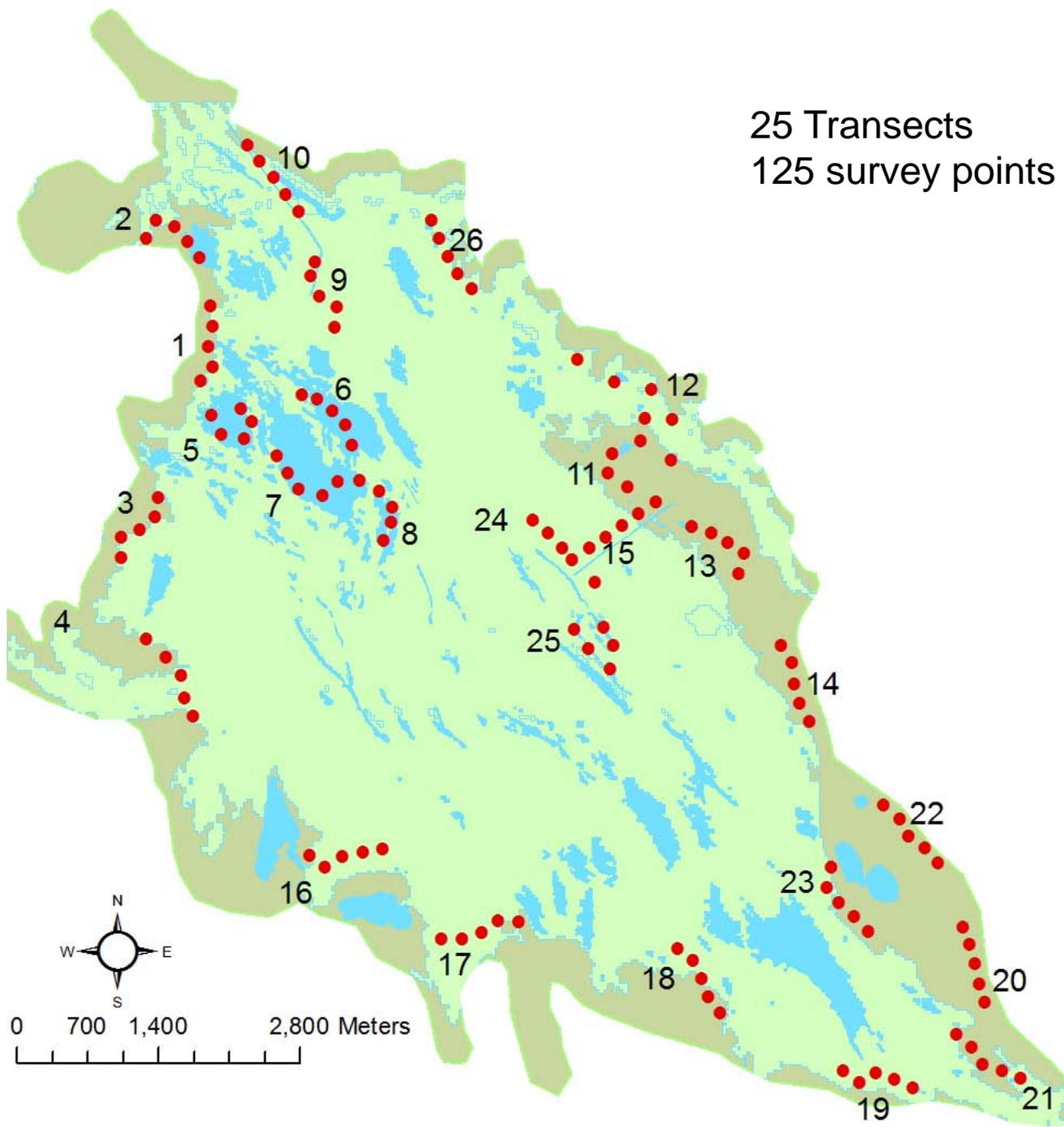


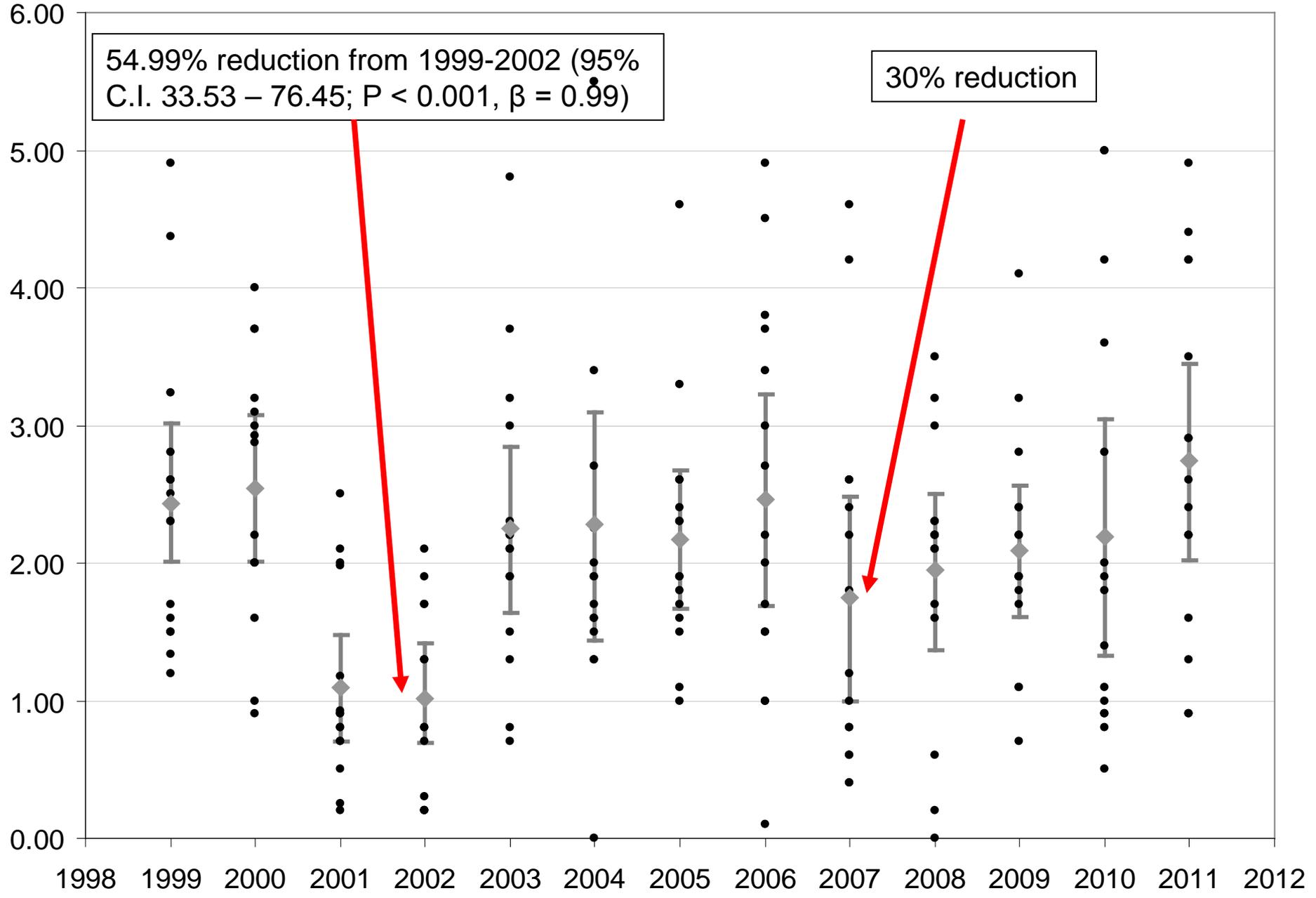
Image by F. Zamora,
Sonoran Institute

Abril 13, 2011, tres semanas después del incendio



25 Transects
125 survey points





Learning Process in the Cienega:

Binational cooperation is possible and essential

Resilient ecosystem within the level of impacts that have occurred

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

Restoration in the Colorado River Delta:

- We have a regulatory framework, public policies and the support from different stakeholders
- Binational cooperation
- Water allocation is feasible
- The protection of large areas of wetlands and floodplain is feasible
- Resilient ecosystem: restoration is possible





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Protect the Flows

Save the Colorado

Save the Colorado River Delta

