

Water management in transboundary arid zones; Tigris and Euphrates watersheds

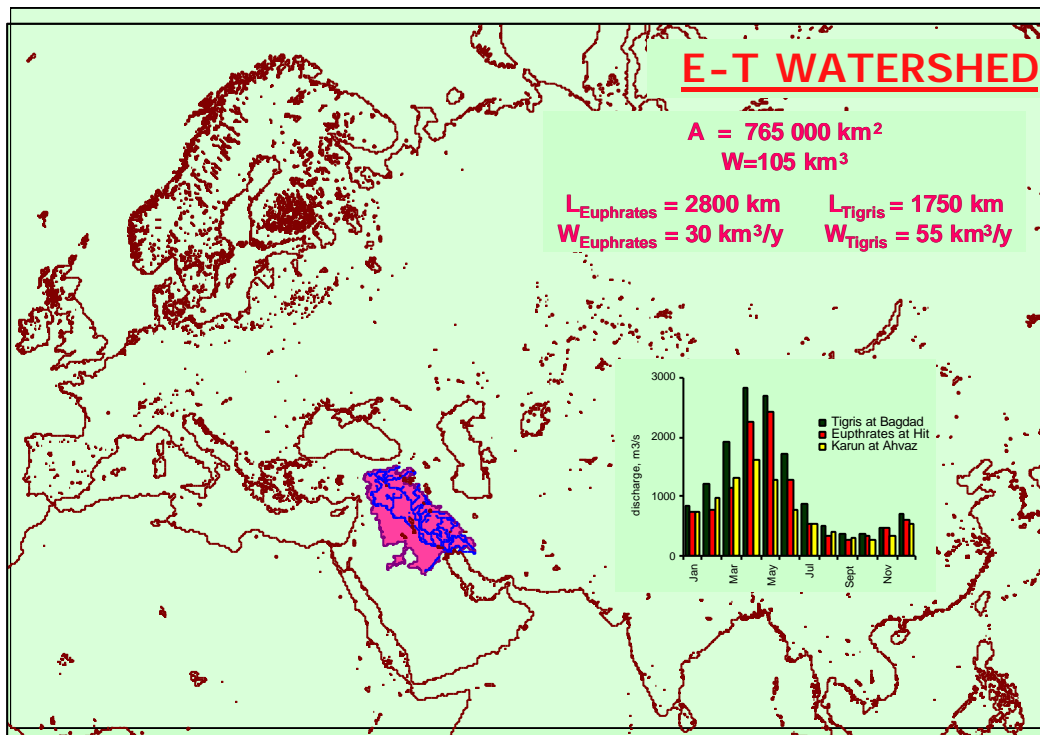
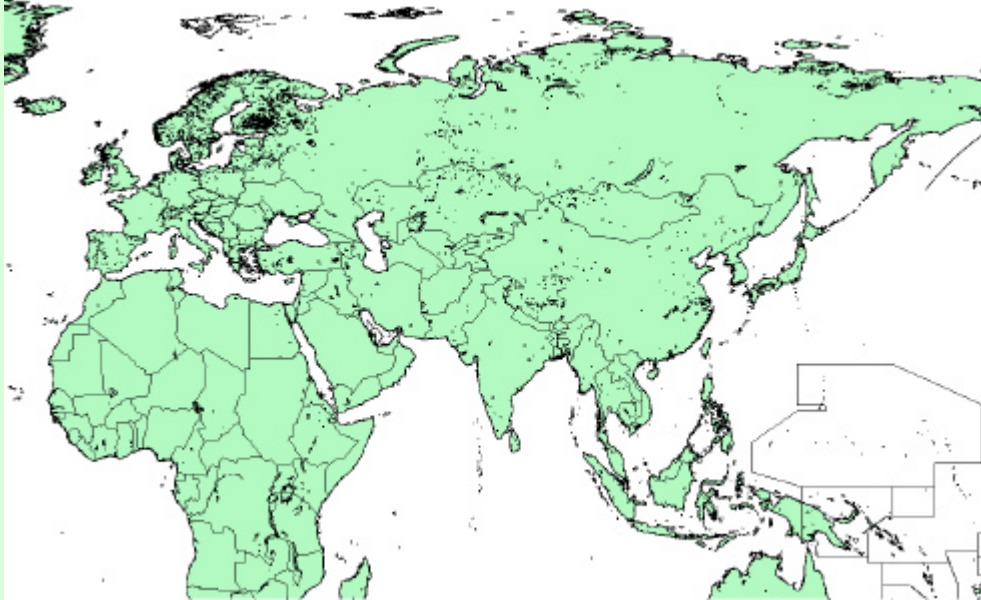
Alexei V. Kouraev, Elena A. Zakharova

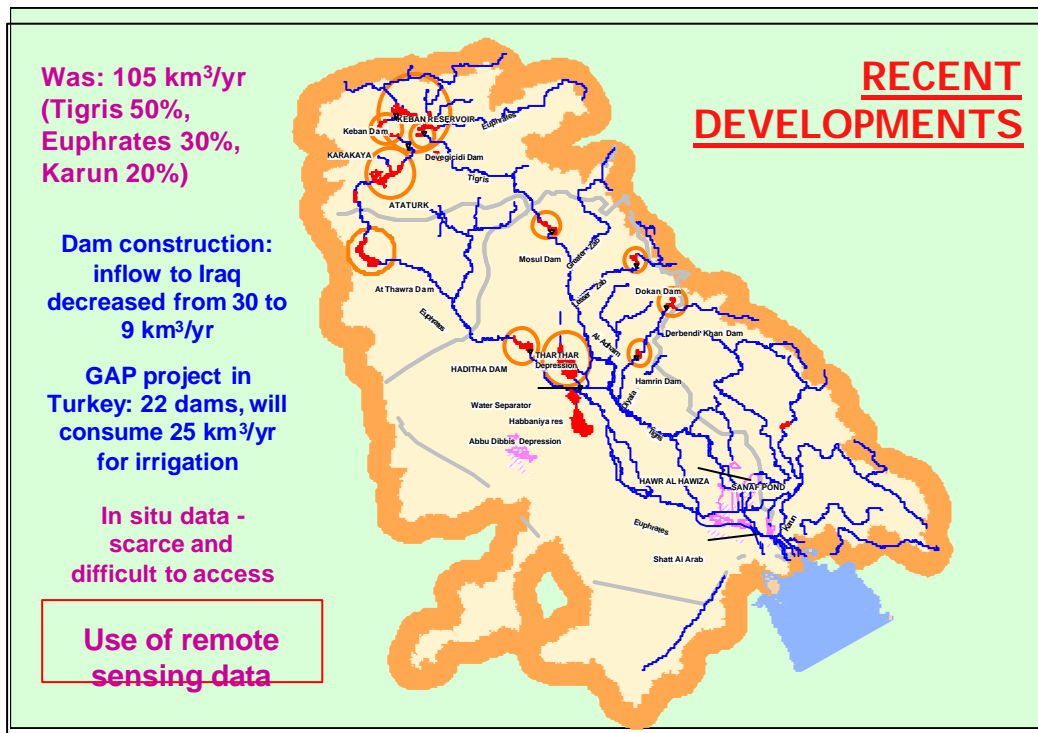
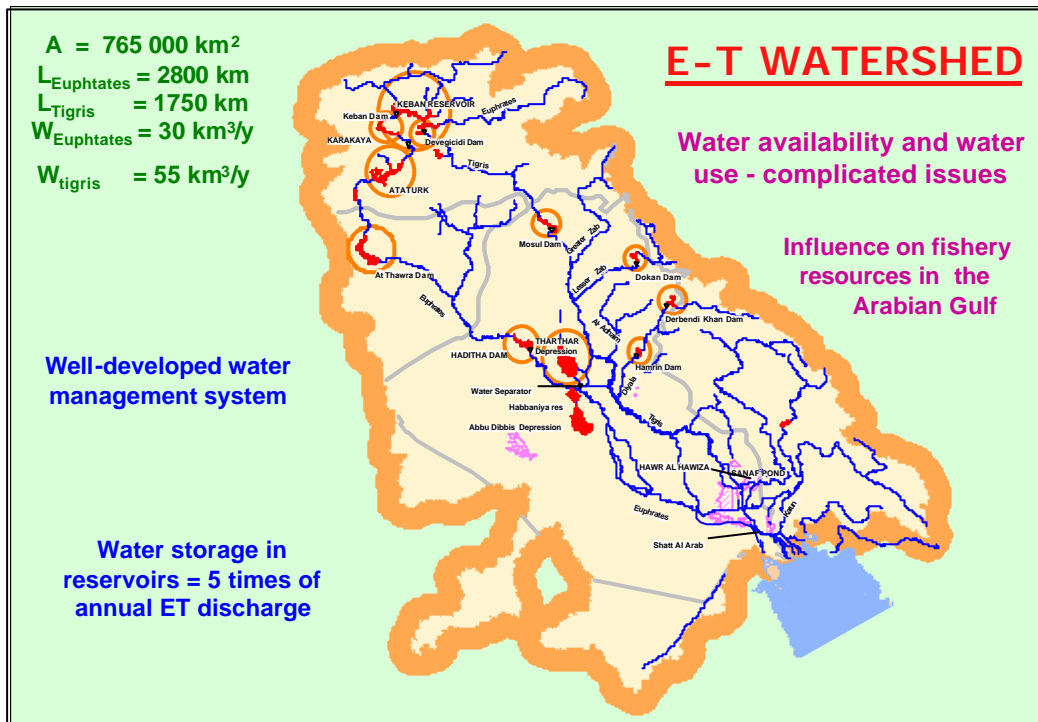
**COSPAR Capacity Building Workshop
and WMO Training Course
on satellite remote sensing and climate change
Tver, Russia, 25 July 2014**

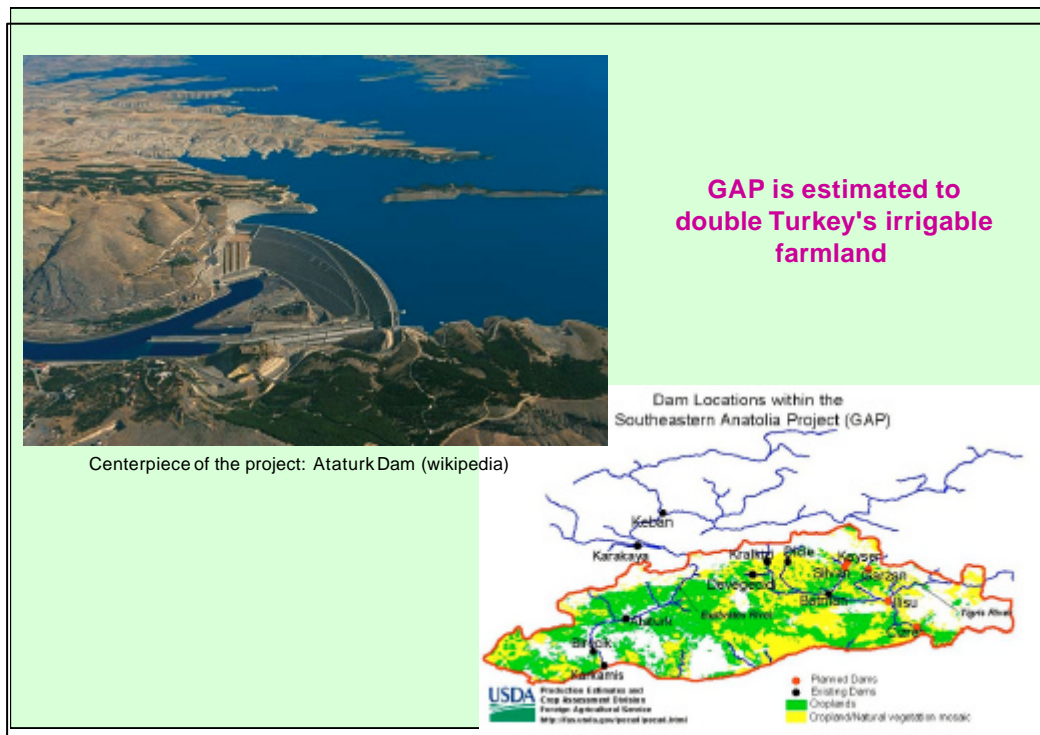
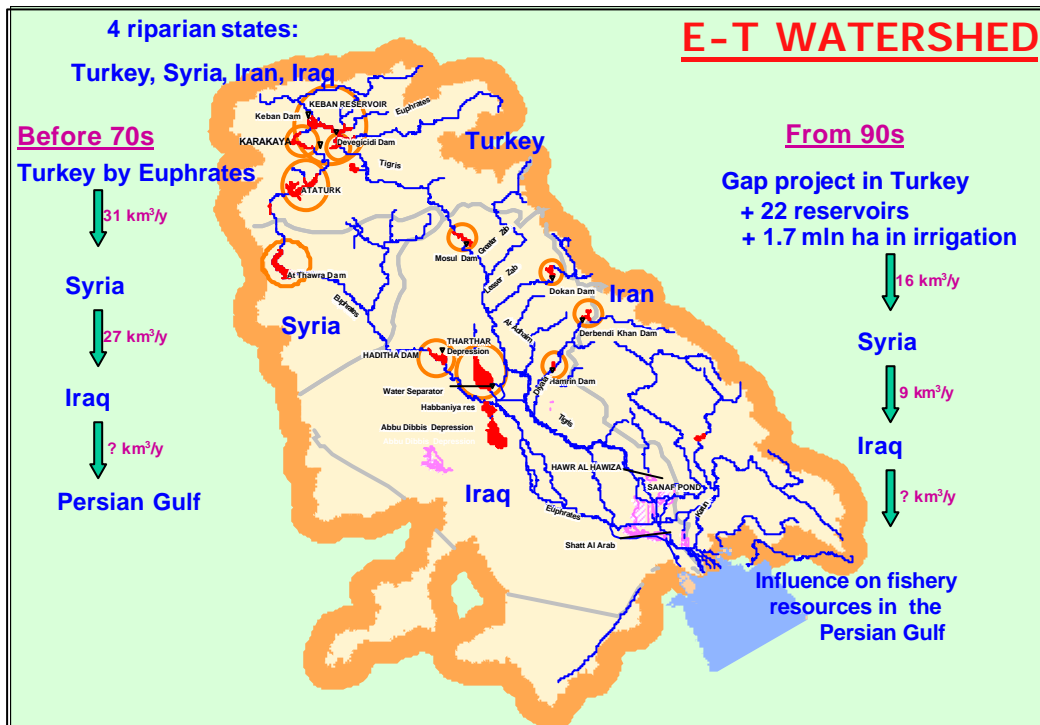
OUTLINE

- **Euphrates-Tigris (ET) watershed**
- **Reservoirs: water level and volume**
- **Monitoring ET marshes**

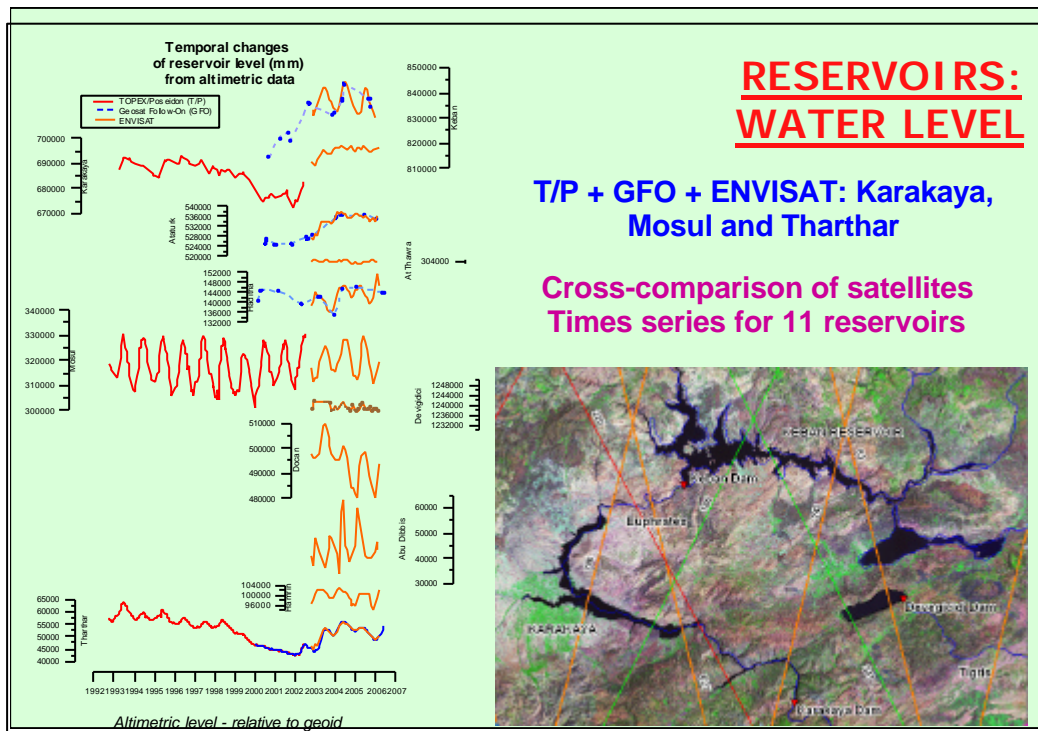
Where is it? What do we know about it?



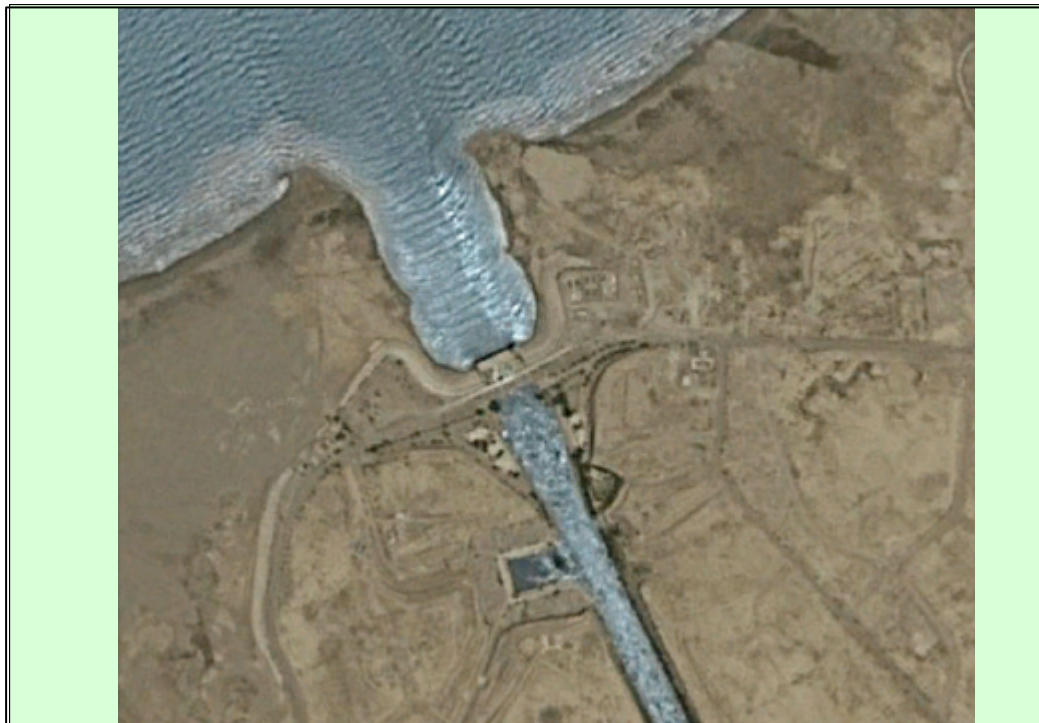




RESERVOIRS: WATER LEVEL AND VOLUME CHANGES







Project Characteristic

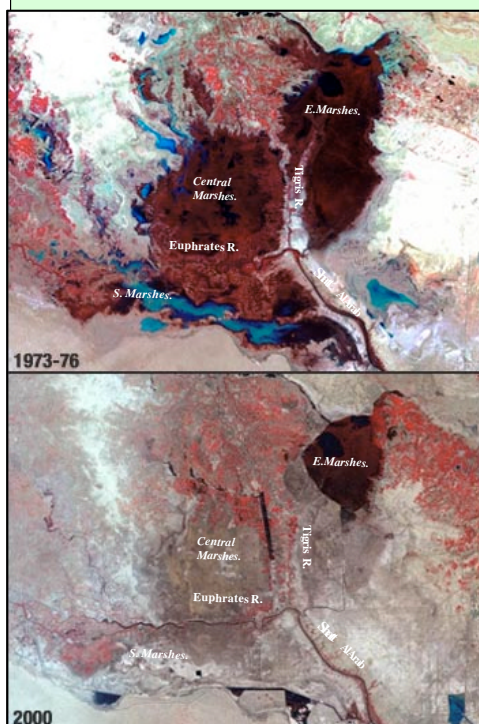
At the start of the 2003 war, the Tharthar project was looted and incurred damage rendering the plant inoperable. The power lines and some towers were stolen or damaged for a distance of approximately 1 km on the two lines feeding the site from Fallujah and Ramadi. The electric power supply was destroyed and the motors, brakes and controls for the eight discharge gates were stolen. Light fixtures and poles for approximately forty fixtures were stolen or destroyed. The 250-KVA transformer on site was damaged and parts have been stolen. All six gates are in the lowered position. Discharge from Tharthar reservoir is currently not possible. A discharge of 450 cms was needed to prevent loss of the regions rice crop. The hoisting equipment consists of a single electric motor driving dual gear reducers with sprocket/chain lift on each end of the gate. The only equipment damaged or looted were the electric motors and brake actuators. Torque tubes, gears, limit switches, sprockets and chains were left intact and undamaged. The gate equipment maintenance crane has had the truck drives, power supply and controls removed and is not functional. The hoisting equipment on the crane hoist trolley above has not been vandalized. There was extensive damage to the project offices, grounds and Saddam's canal palace buildings. The raw water pumps (used for service maintenance) located on the downstream side have been looted. Power and communication cable have been cut and stolen throughout the project. Locals are still on site looting and stealing project assets. At the time of the inspection, neither the ministry nor US troops were on site for security.

Source: New Eden
Master Plan



Hussein Jomali, U.S. Army Corps of Engineers, 2003

MESOPOTAMIAN MARSHES: FLOODING REGIME AND LEVEL CHANGES



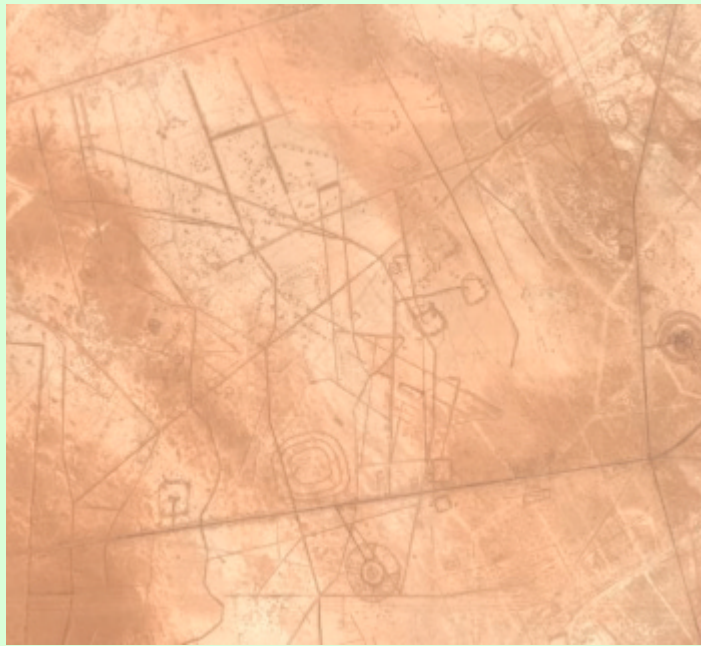
MESOPOTAMIAN MARSHES

Changes in the marshes from Landsat
MSS imagery

20,000 km² in 70s

3,000 km² in 90s







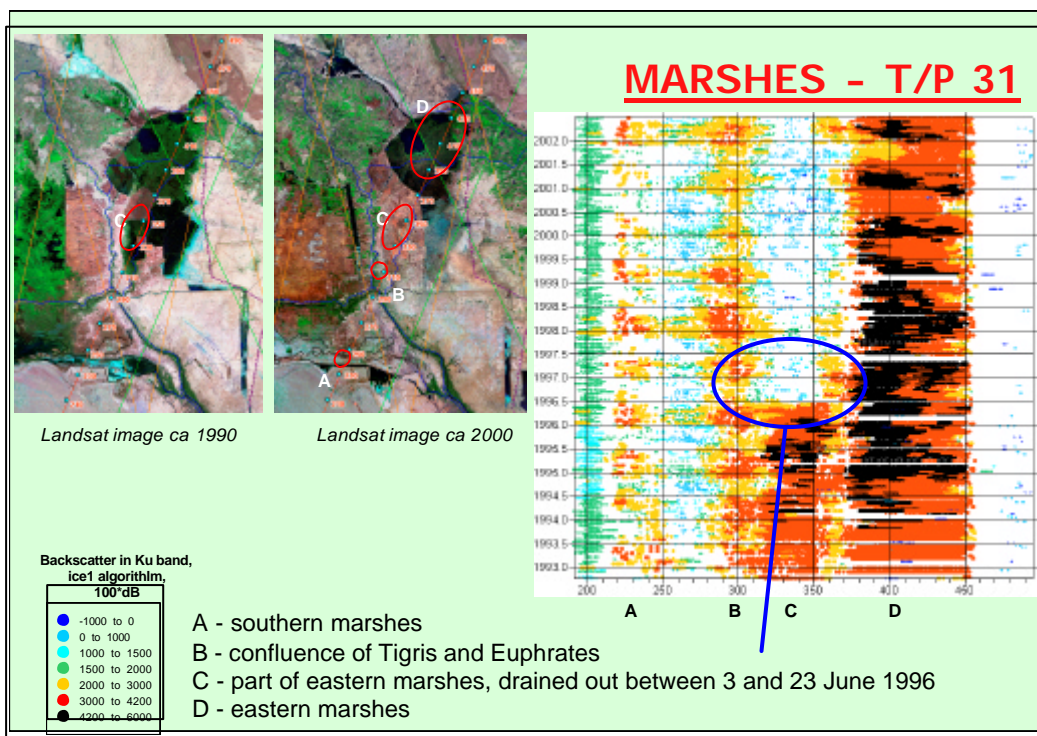
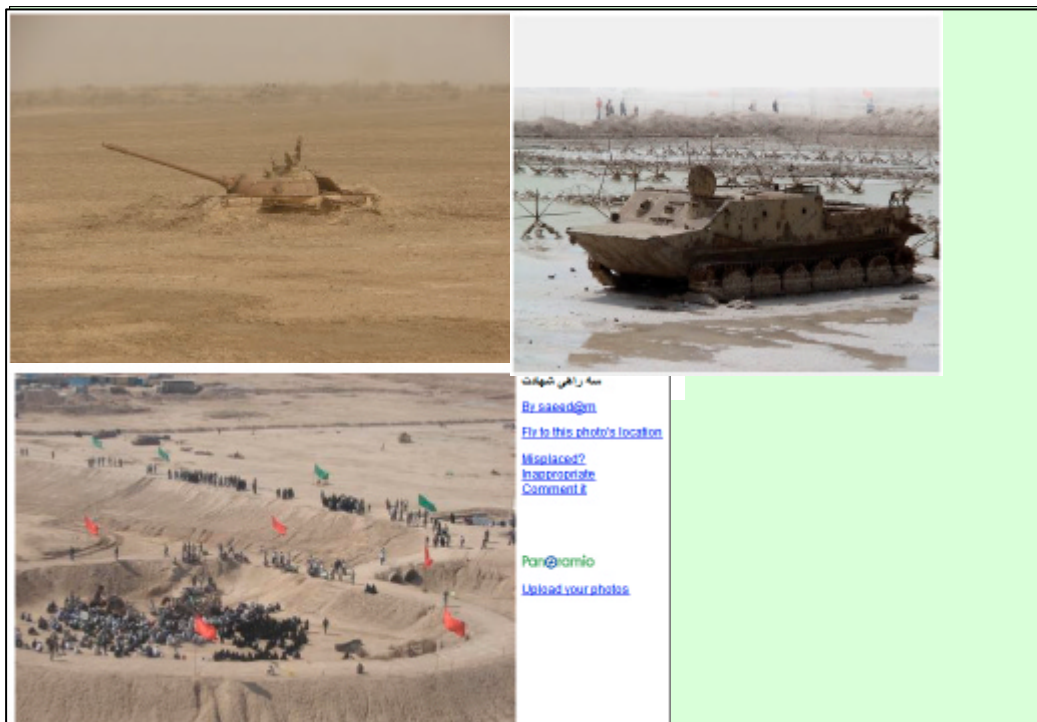
Iraq Wars

Iran–Iraq War (the First Persian Gulf War):
22 September 1980 – 20 August 1988

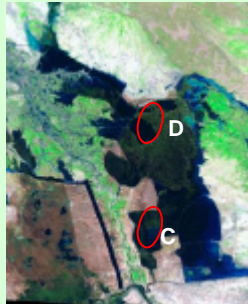
The Persian Gulf War
2 August 1990 – 28 February 1991 (officially ended 30
November 1995)

Second Gulf War/ Operation Iraqi Freedom
March 20, 2003 — Current (?)

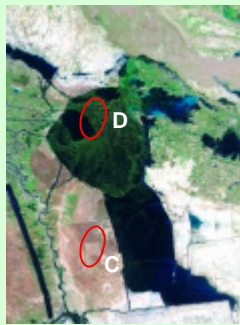
Recent events (2014)



EASTERN MARSHES WATER LEVEL



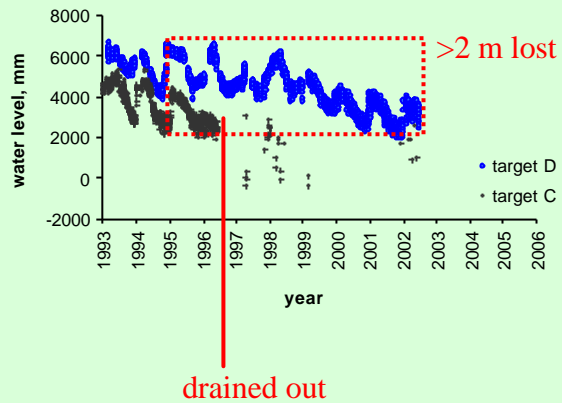
Landsat image March 1993



Landsat image April 1998

D - permanent
marshes

C - marshes
drained out in
1996

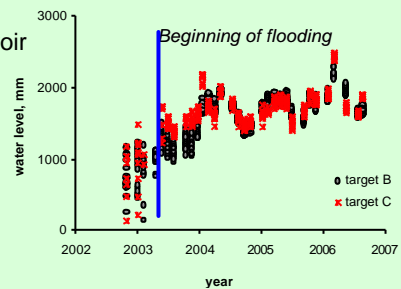


MARSHES - ENVISAT 741 INONDATION



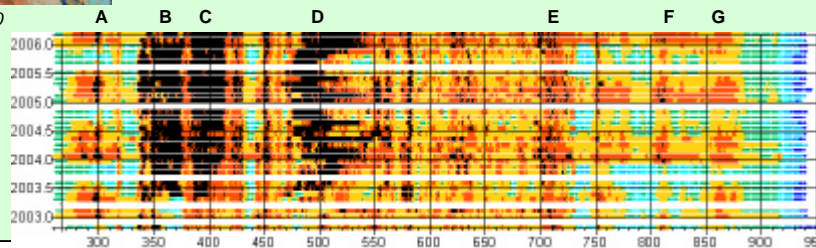
Landsat image ca 2000

A - channel
B and C - flooded southern marshes
D - channel
E - flooded triangle reservoir
(see also 642)
F - flooded area
G - flooded area

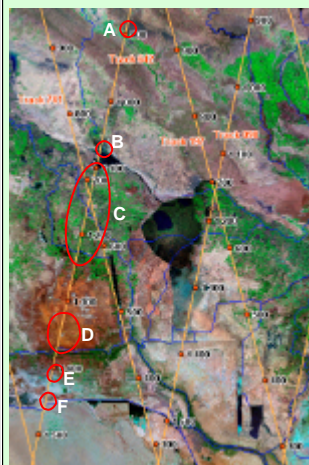


Backscatter in Ku band,
ice1 algorithm,
100 dB

- -1000 to 0
- 0 to 1000
- 1000 to 1500
- 1500 to 2000
- 2000 to 3000
- 3000 to 4200
- 4200 to 6000

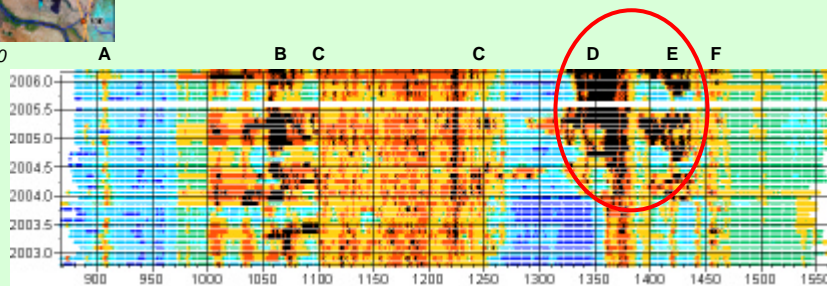


MARSHES - ENVISAT 642 INONDATION

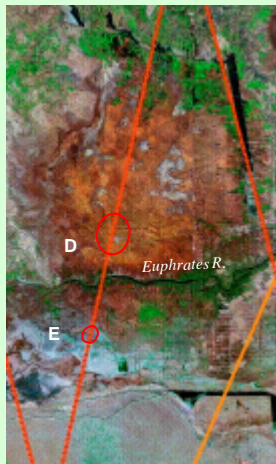


Landsat image ca 2000

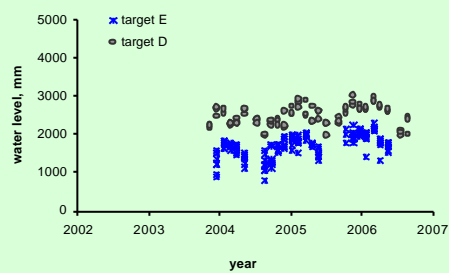
Backscatter in Ku band,
ice1 algorithm,
100°dB



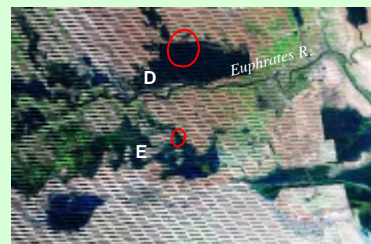
MARSHES - ENVISAT 642 WATER LEVEL



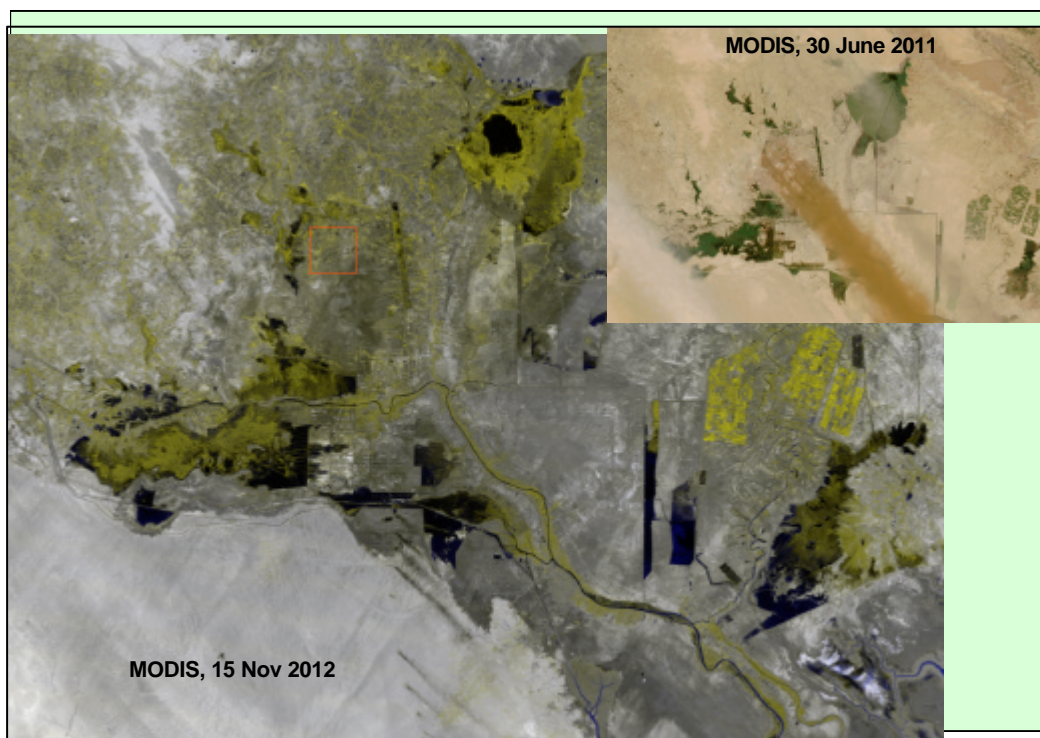
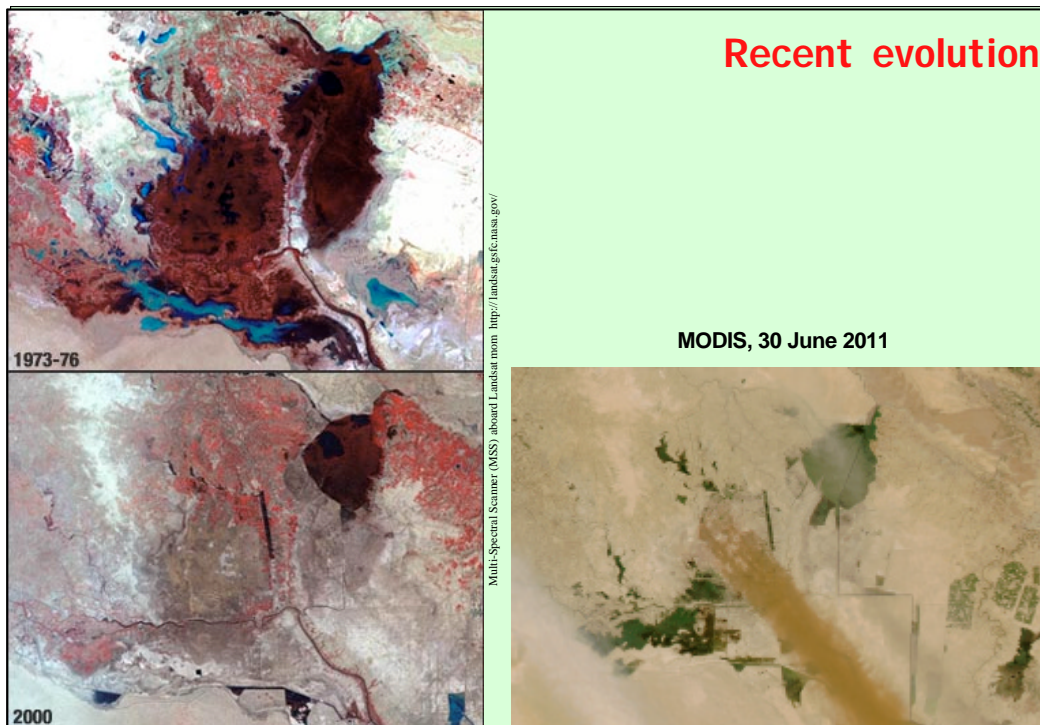
Landsat image ca 2000



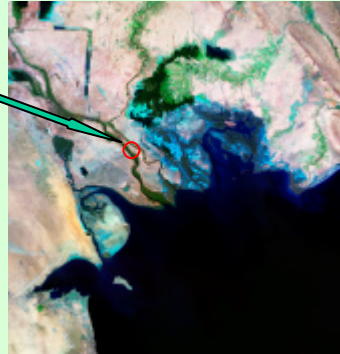
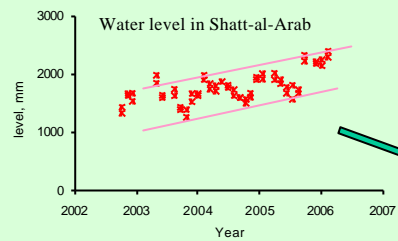
Southern marches:
drained out in 1996
flooded in 2003/2004



Landsat image March 2004



IMPACT ON PERSIAN GULF



What is the primary source of
revenues for Kuwait?



Kuwait revenues:

Oil: 20 bln \$/year

**Shrimp: 25 mln \$/year
(less than 1/1000)**



<http://mktgaur.files.wordpress.com/2007/08/00kawaaitshrimp.jpg>