



ROMANIAN EXPERIENCES REGARDING ECOLOGICAL RESTORATION IN DANUBE FLOODPLAIN AND DELTA

**DANUBE DELTA
NATIONAL INSTITUTE
FOR RESEARCH & DEVELOPMENT**
TULCEA - ROMANIA



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Romanian Ministry of Agriculture, Forests,
Waters and Environment

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DANUBE DELTA NATIONAL INSTITUTE FOR RESEARCH & DEVELOPMENT TULCEA - ROMANIA



Romulus STIUCA
Danube Delta National Institute
Tulcea - ROMANIA





FOR MORE INFO...

[Http://www.indd.tim.ro](http://www.indd.tim.ro)

Danube River and Danube Basin



DANUBE DELTA

Satellite image S=5800 sq.km

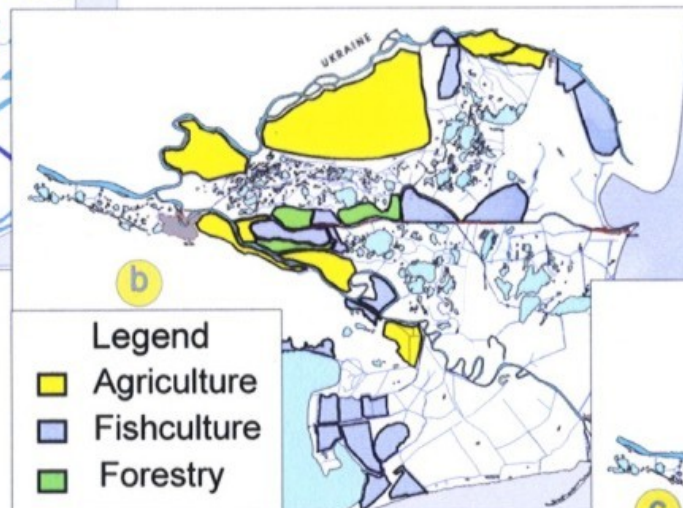


Black Sea

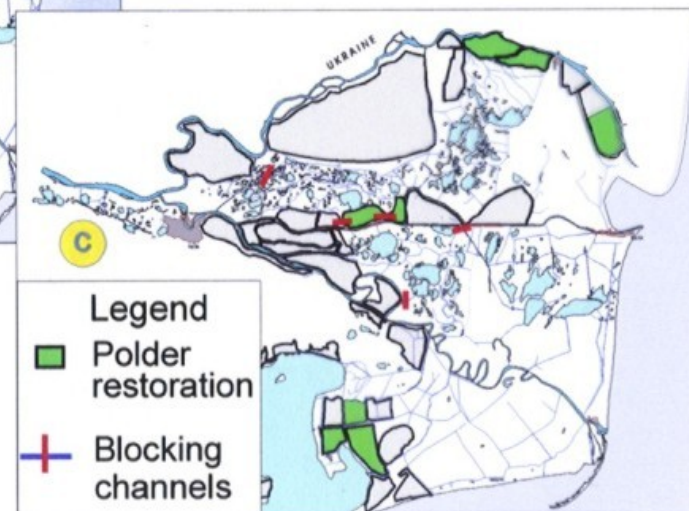
- **Part of the Man and Biosphere Programme of UNESCO since 1990**
- **Included in Ramsar Convention List since 1990**
- **Included in World Heritage List since 1990**



Pristine status
(Hartley, 1887)



Building polders and channels
(1880-1899)

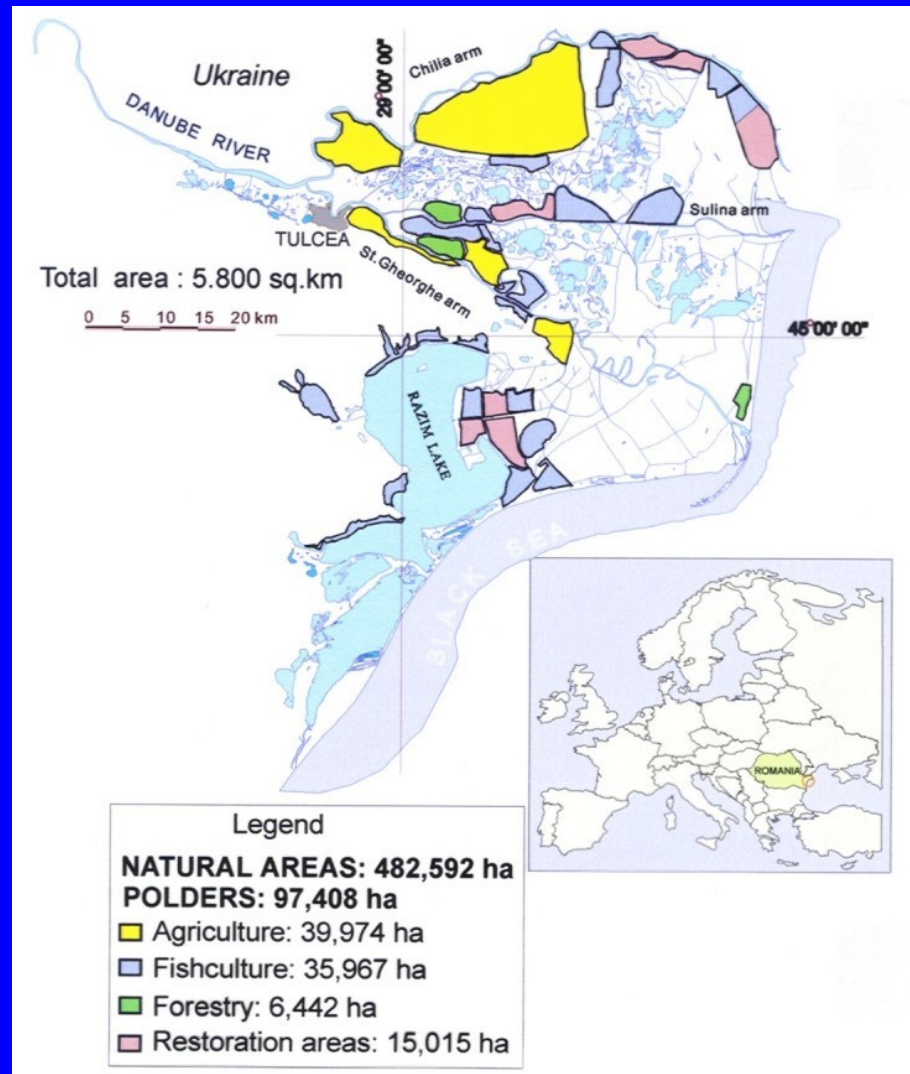


Restoration works (1994-2000)

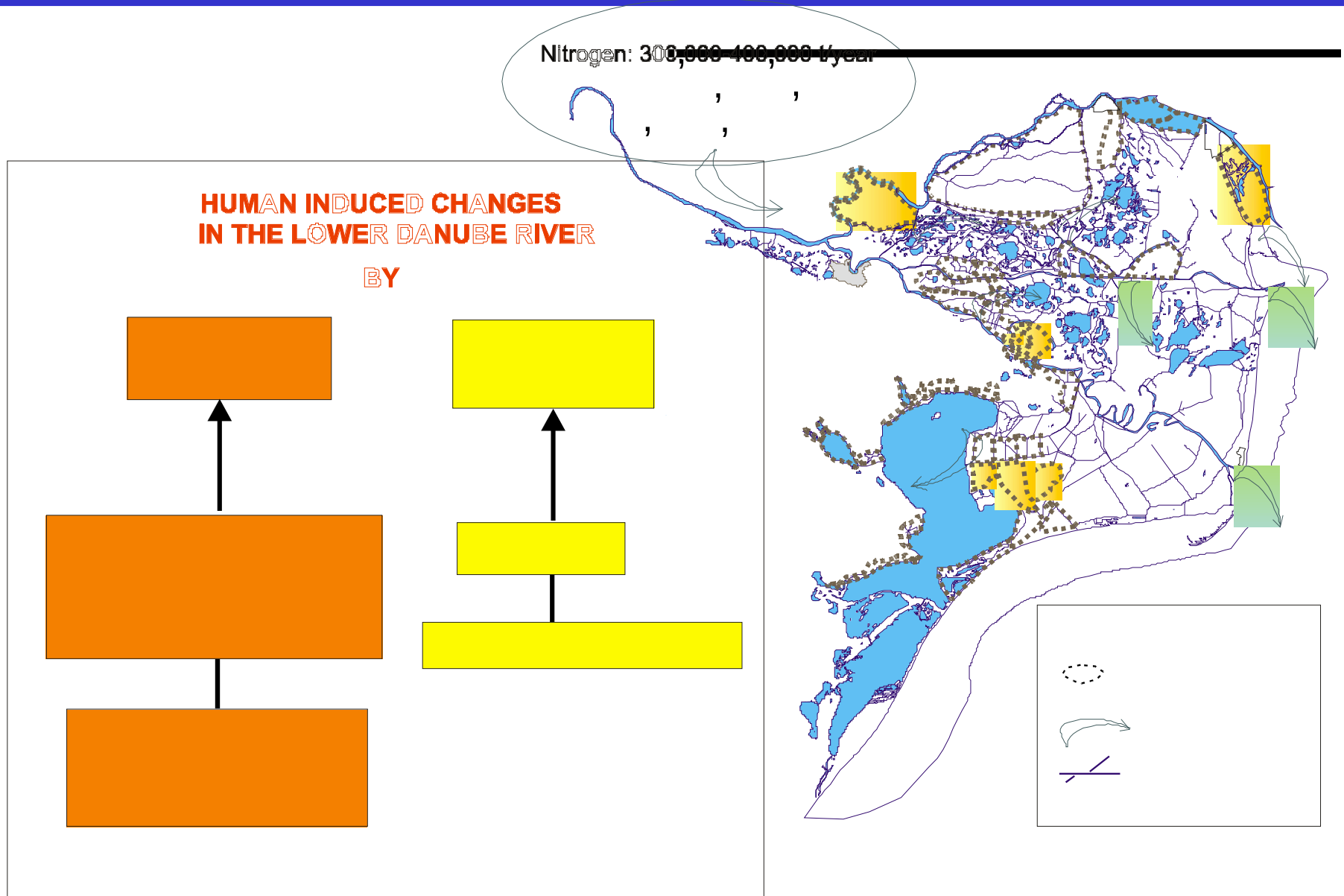
PHASES IN THE DANUBE DELTA RECENT HISTORY

Channels
blocking

DANUBE DELTA BIOSPHERE RESERVE LOCATION AND PRESENT GENERAL LAND USE

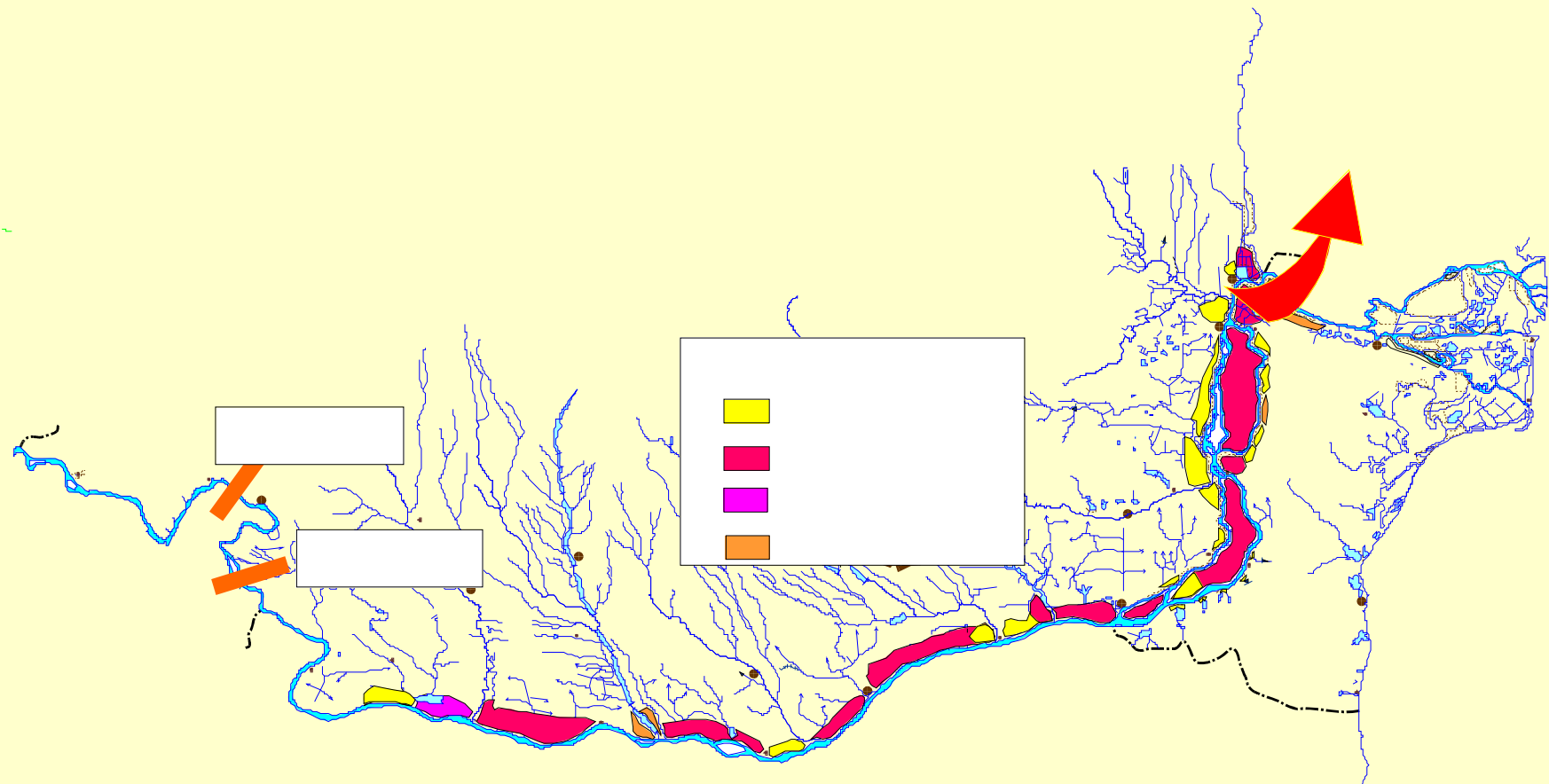


HUMAN INDUCED CHANGES IN THE DANUBE DELTA

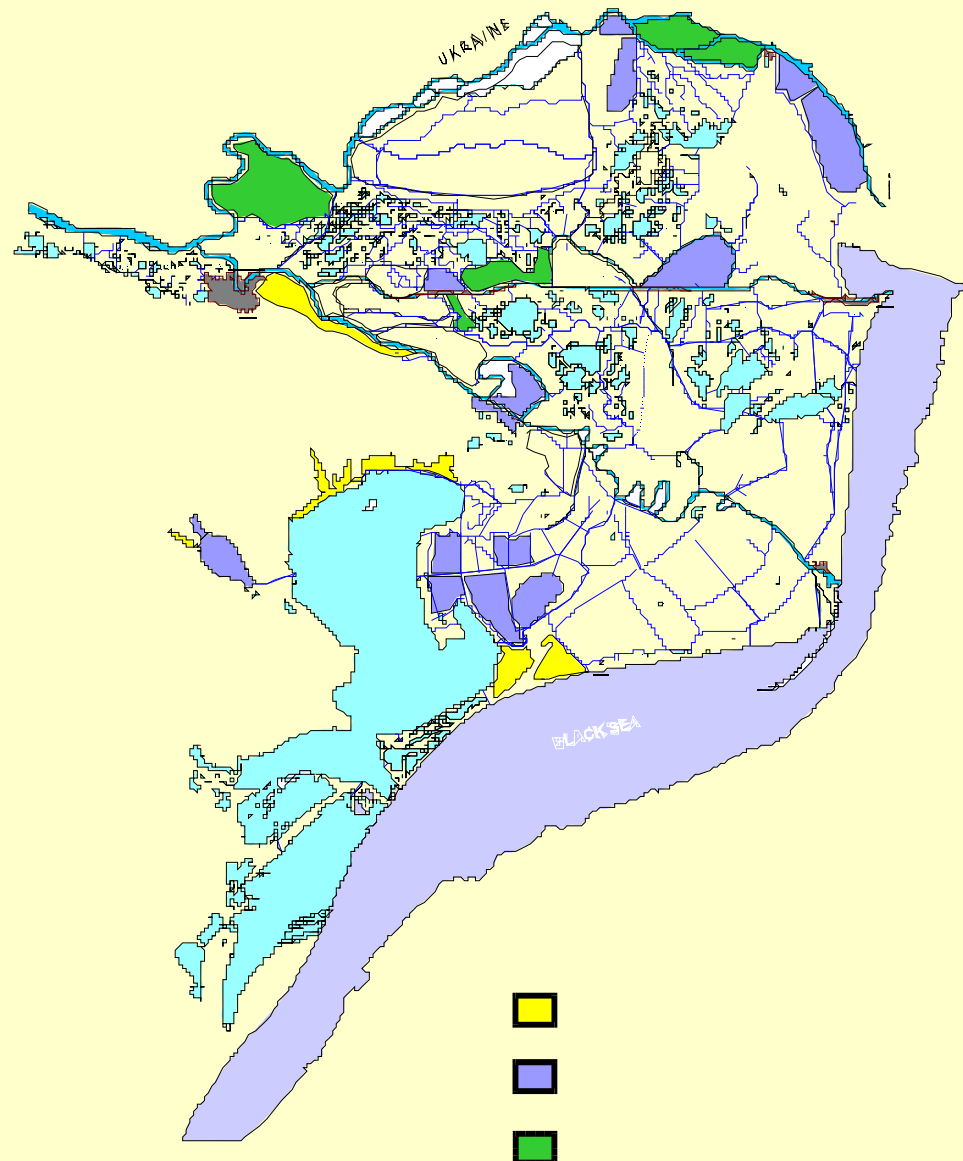
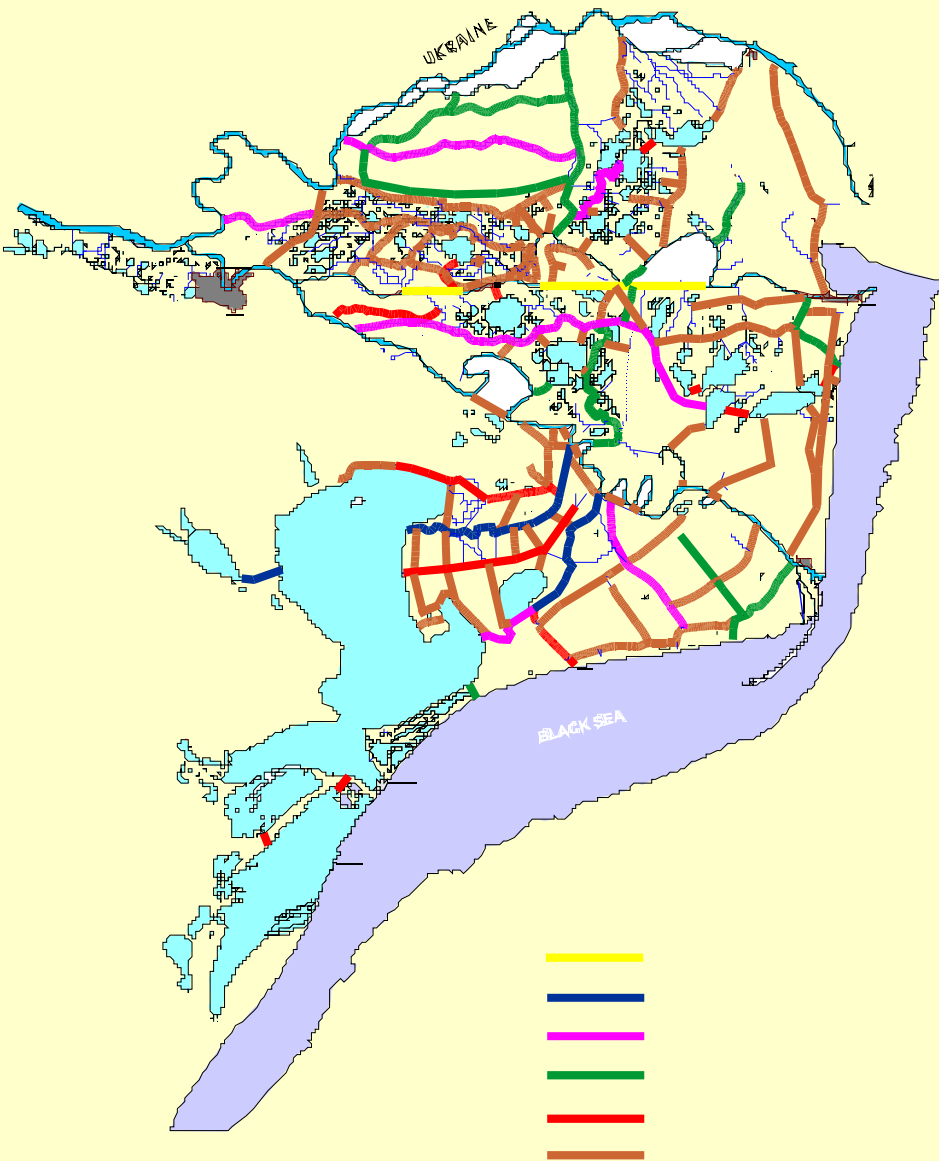


DAMMING FLOODPLAIN UPSTREAM THE DELTA

DAMMING OF DANUBE RIVER FLOODPLAIN IMPACT ON DANUBE DELTA'S FISHERY



DAMMING AND CHANNEL EXCAVATIONS



HYDROLOGY AND WATER CHEMISTRY CHANGES

DANUBE RIVER

Water inflow (cm/s)

P(PO₄) (mg/l)

N(NO₃) (mg/l)

P(PO₄) inflow
tons/year

N(NO₃) inflow
tons/year

DELTA ECOSYSTEMS

Before 1960

1971-1980

1980-1989

309

359

620

<0.01

0.06

0.07

0.4

1.5

1.5

100

700

1,400

4,000

17,000

29,300

THE REHABILITATION PROGRAMME

REHABILITATION MANAGEMENT OBJECTIVES

*Ob.1. Protect
and maintain
population of
species and
habitats with
ecological
values*



Ob.2. Carry out restoration works where natural or semi natural character has been lost



Ob.3. Manage water circulation in order to improve the ecological conditions

Ob.4. Assess the effectiveness of existing buffer zones and if necessary recommend modifications

THE REHABILITATION PROGRAMME HAS TWO MAIN CATEGORIES OF PROJECTS

•WETLAND RESTORATION PROJECTS

- Research, design, monitoring: DDNI in cooperation with RIZA – the Netherlands and Institute for Floodplain Ecology, Rastatt, WWF Germany
- Civil works: DDBRA

•HYDROLOGICAL SYSTEM REHABILITATION PROJECTS

- Research and design: DDNI &RIZA
- Civil works: DDBRA

ADDITIONAL COMPONENTS

- **Restoration of habitats and ecosystems**
- **Restoration of the endangered species**
- **Restoration of the affected landscape**

The main actors

PARTNERS:



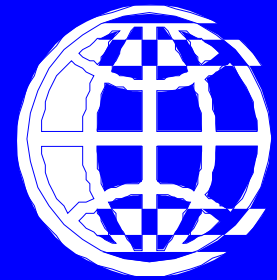
WWF Auen Institute, Rastatt, Germany



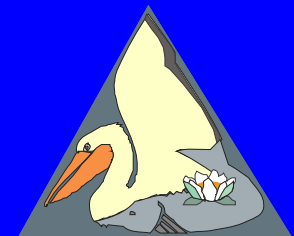
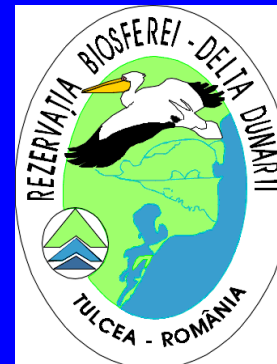
RIZA Institute, Lelystat, The Netherlands



**ROMANIAN MINISTRY
OF AGRICULTURE,
FORESTS, WATERS
AND ENVIRONMENT**



WORLD BANK



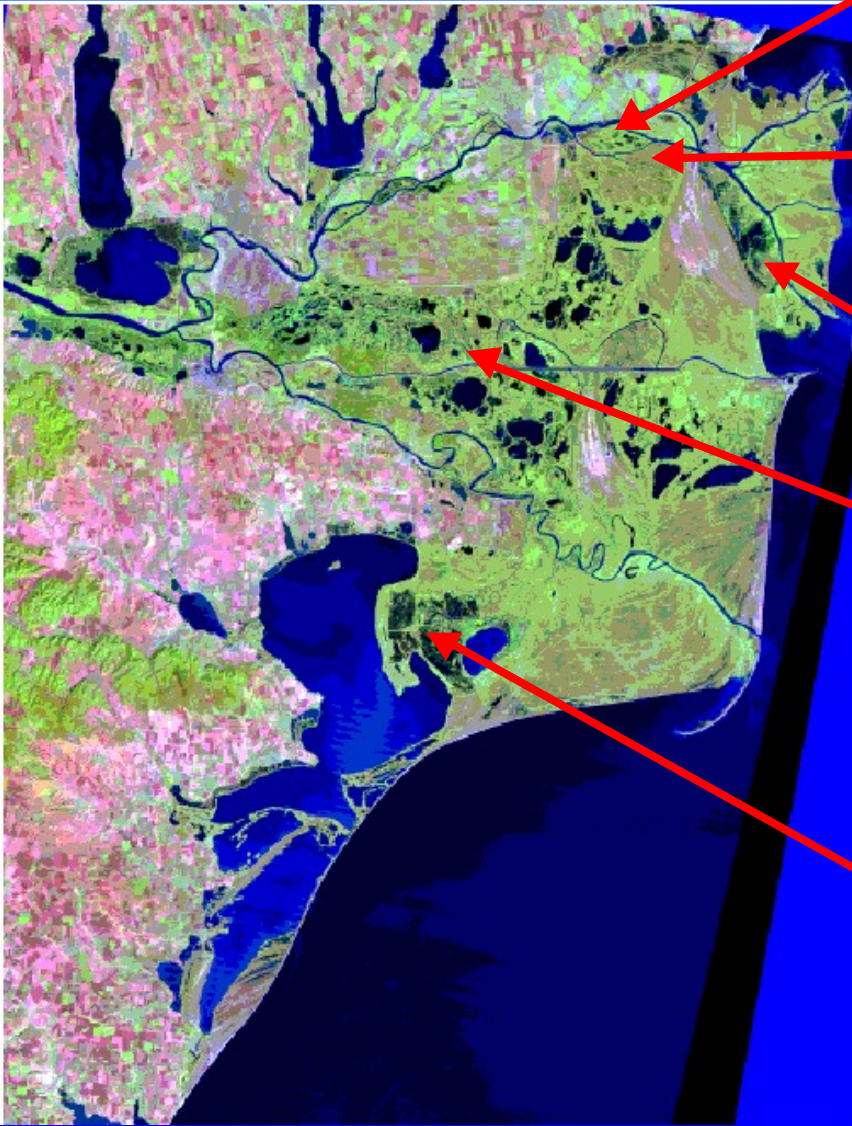
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FOR RESEARCH AND DEVELOPMENT
TULCEA / ROMANIA**

WETLAND RESTORATION PROJECTS

Objectives:

- **Restore the specific functions of the wetlands**
- **Restore lateral connectivity and reintegration in the natural river pulse system**
- **Restore the natural habitats that support biodiversity and natural resources**
- **Recover traditional economic activities of the local communities**

Implemented and ongoing Restoration Works in the Danube Delta



◆ In 1994 Babina (2,100 ha),

- agricultural polder -

◆ in 1996 Cernovca(1,580 ha)

- agricultural polder -

◆ in 2000 Popina(3,600 ha)

- fishpond -

◆ in 2002 Fortuna (2,115 ha) -

- agricultural polder -

Prospective areas to be restored

◆ Holbina - Dunavat(5,630 ha)

- fishponds -

TOTAL: 15,025 ha

BABINA-CERNOVCA PILOT PROJECT

S = 2,100 ha Babina, 1,580 ha Cernovca, former agriculture polders (drained areas)

- Research: 1991-1994, cooperation with Institute for Floodplain Ecology, Rastatt, WWF Germany**
- Monitoring: 1995-2002**
- Project status: fully implemented, Babina reverted to wetland since 1994, Cernovca since 1996**
- Present status: a mosaic of water types, clear to turbid water systems, depending on the connectivity to the river**

BEFORE FLOODING



AMENAJARE AGRICOLĂ ABANDONATĂ ÎN DELTA DUNĂRII

Abandoned agricultural polder in the Danube Delta before restoration

2 YEARS AFTER FLOODING

AMENAJARE AGRICOLĂ RENATURATĂ ÎN DELTA DUNĂRII
Agricultural polder in the Danube Delta after restoration



AMENAJARE AGRICOLĂ ABANDONATĂ ÎN DELTA DUNĂRII

Abandoned agricultural polder in the Danube Delta before restoration



AMENAJARE AGRICOLĂ RENATURATĂ ÎN DELTA DUNĂRII
Agricultural polder in the Danube Delta after restoration



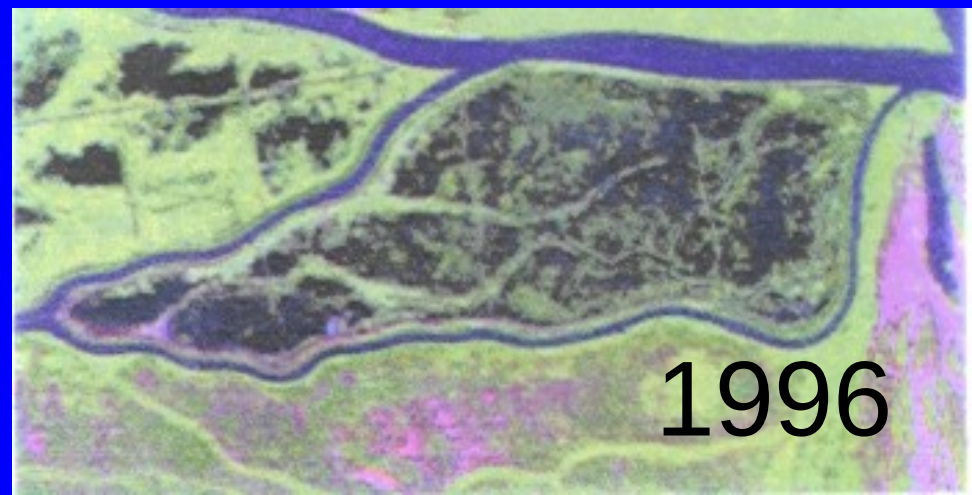
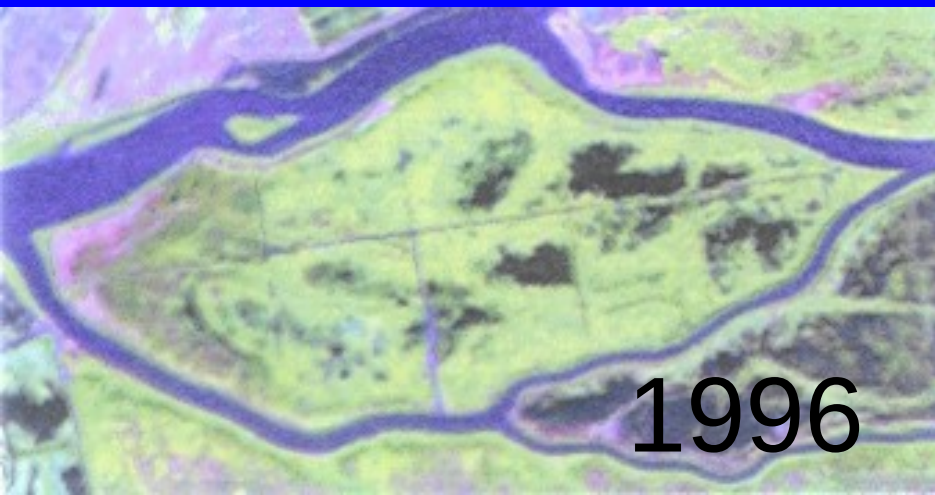
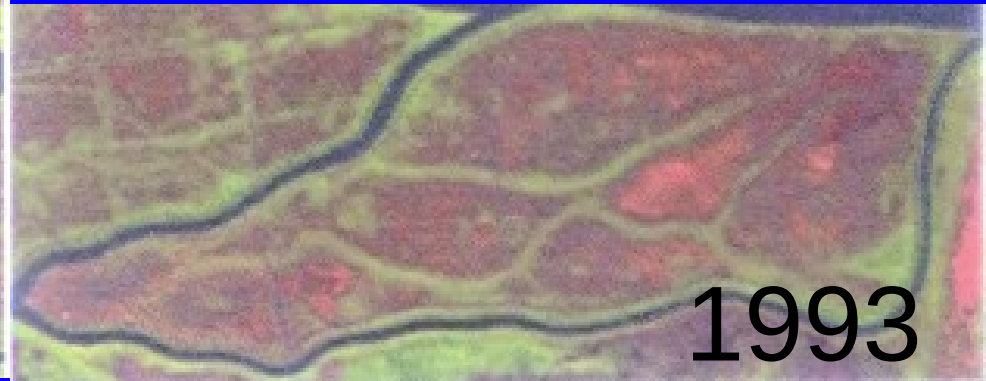
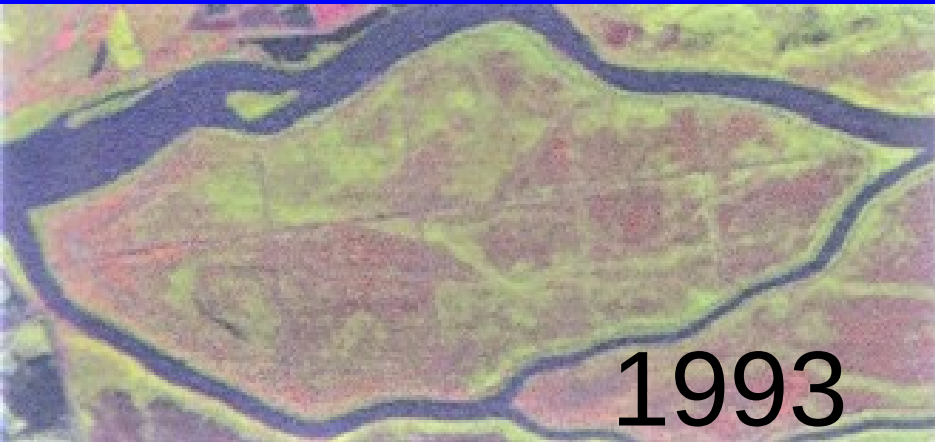
**CONTACT OF CLEAN WATER FROM RESTORED AREA
WITH DANUBE WATERS RICH IN SEDIMENTS**



CONTROL FISHING RESULTS IN RESTORED AREAS INDICATES
THE PRESENCE OF BOTH REPRODUCER AND YOUNG FISHES



Babina-Cernovca area (satellite images)



RECOVERING OF THE NATURAL FUNCTIONS OF WETLANDS



- Hydrological
- Bio-geo-chemical
- Ecological
- Social-economic

BENEFITS OF ECOLOGICAL RESTORATION BABINA&CERNOVCA PILOT PROJECTS - S=3,600HA

UNSUSTAINABLE / ABANDONED ARRANGED COMPLEXES

WETLAND REHABILITATION

ECONOMICAL RESULTS

**FISH: 34 KG/HA/YEAR
REED: 1-2 TONES/HA/YEAR
PASTURE: 0,5 UVM/HA/YEAR**

**50-100 EURO/HA/YEAR with low costs
instead subsidies**

ECOLOGICAL VALUES

NUTRIENT REMOVAL

- 15 KG PHOSPHORUS/HA/YEAR
- 335 KG NITROGEN/HA/YEAR

SEDIMENT RETENTION

- 11 TONES/HA/YEAR

HABITAT FOR BIRDS AND FISHES

AESTHETIC VALUES

WATER STORAGE

ECONOMICAL INDICATOR: MAXIMUM COST/BENEFIT RATIO

BABINA&CERNOVCA PILOT PROJECTS - S=3,600HA

COSTS:

RESEARCH, DESIGN & IMPLEMENTATION: 100,000 EURO

BENEFITS:

FISH YIELD: 3,600HA x 34KG x 0.5EURO/KG = 60,000EURO/YEAR

REED HARVEST: 3,600HA x 1T/HA x 16EURO/T = 60,000EURO/YEAR

TOURISM: 10TURISTS x 100DAYS/YEAR x 10EURO/DAY = 10,000EURO/YEAR

CATTLE: 100HA x 0.5UVM/HA x 100KG x 2EURO/KG = 10,000EURO/YEAR

TOTAL VALUE : 140,000 EURO/YEAR
at low labour costs

**OTHER
WETLAND REHABILITATION
PROJECTS**

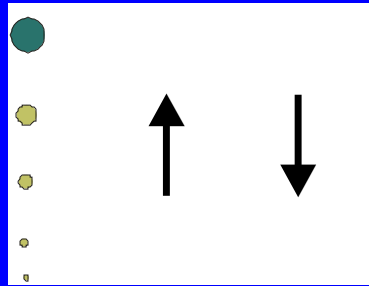
HOLBINA-DUNAVAT PROJECT

S = 5,630 ha, former fish farms

- Research: 1993-1996**
- Result: Restoration strategy**
- Implementation status: investment funds available since 2003**
- Evolution: water system reverted from turbid plankton-dominated to clear macrophytes –dominated state (!)**

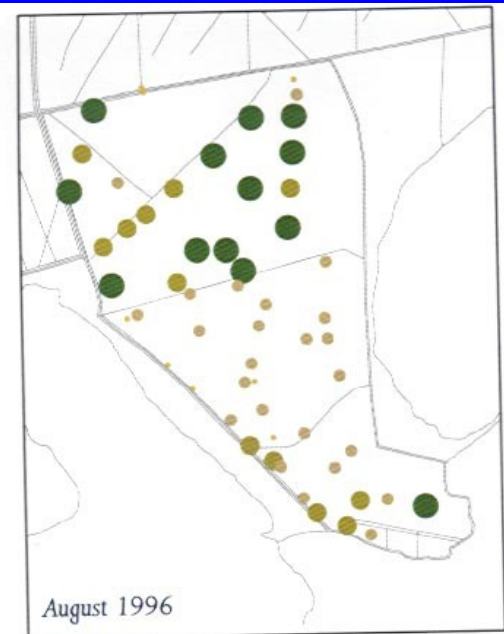
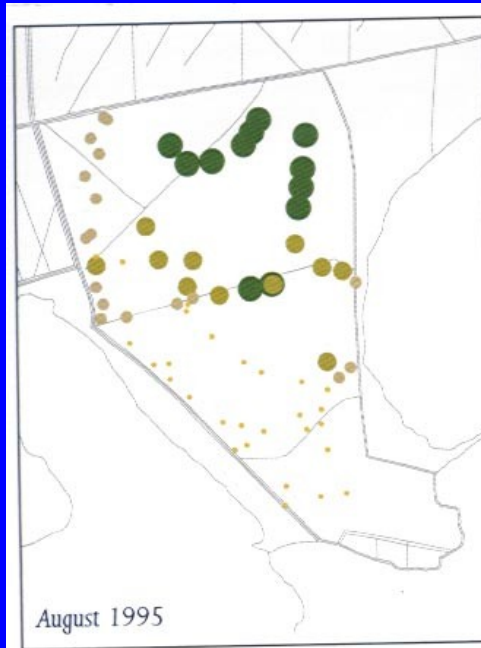
Secchi depth in 1995, 1996, 1997, 2002

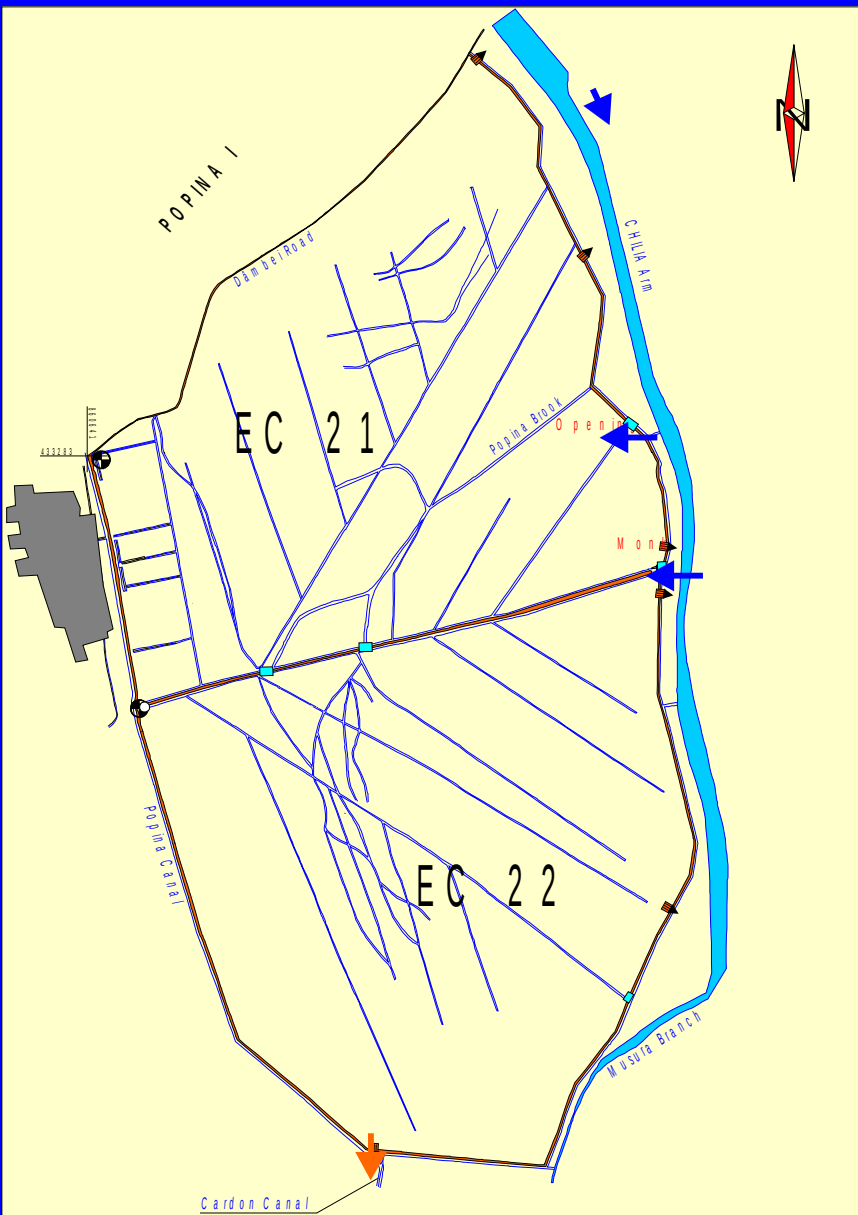
(Drost et al, 2002)



**Unstable
ecosystem ?**

**Needs for
further
research**





POPINA PROJECT

- S = 3,600 ha, fish ponds**
- Research: 1996-1999**
- Implemented since 2000**
- Status: permanent wetland connected to the river pulse system**

FORTUNA PROJECT

- S = 2,115 ha
- Former polder for forestry
- Research: 2000-2002
- Present status: under implementation



Hydraulic connectivity restoration

S = 687 ha

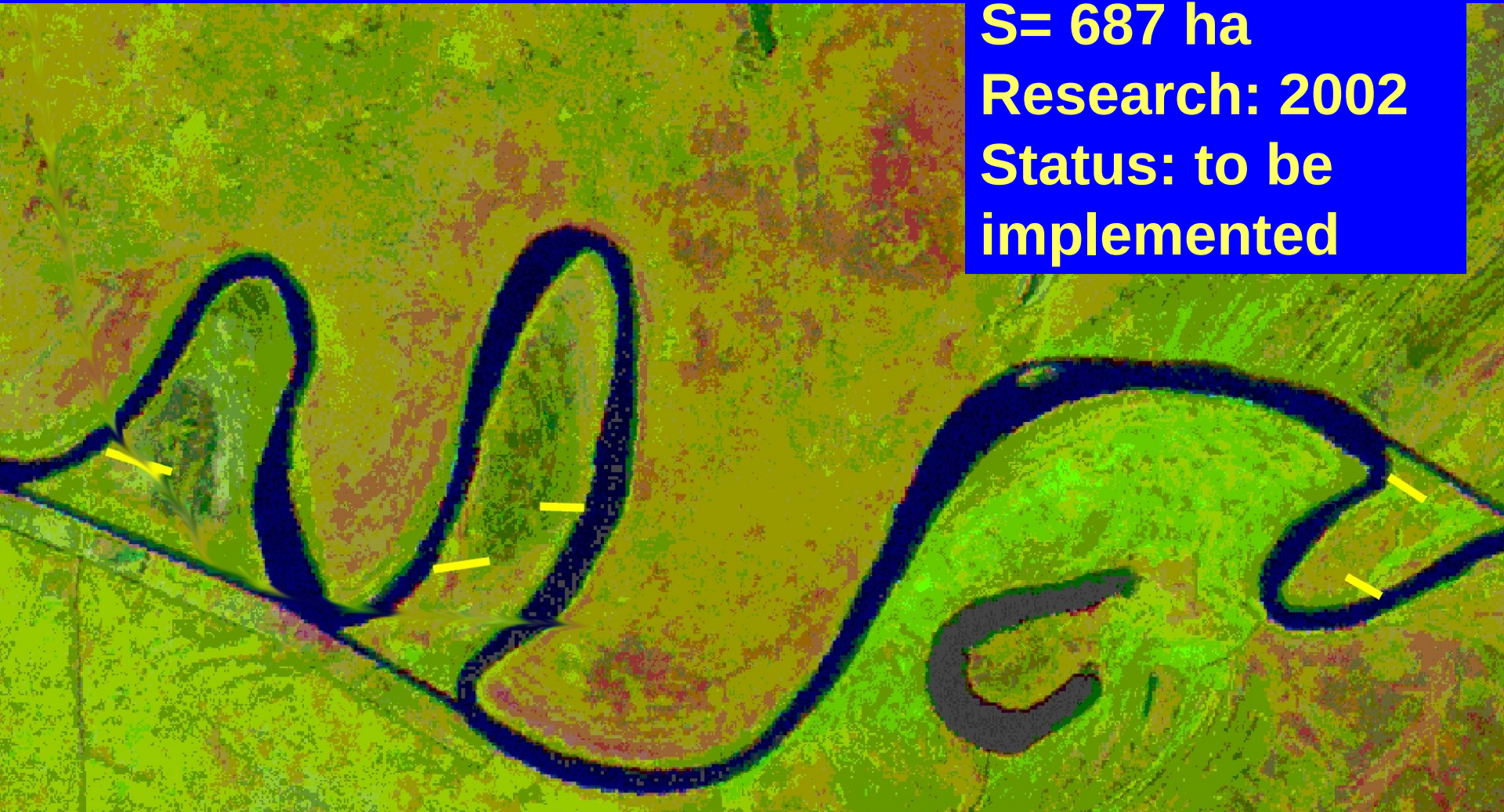
- Origin: Islets formed by cutting meanders**
- Research: 2002**
- Restoration to be implemented**

MEANDERS PROJECT

S= 687 ha

Research: 2002

Status: to be
implemented

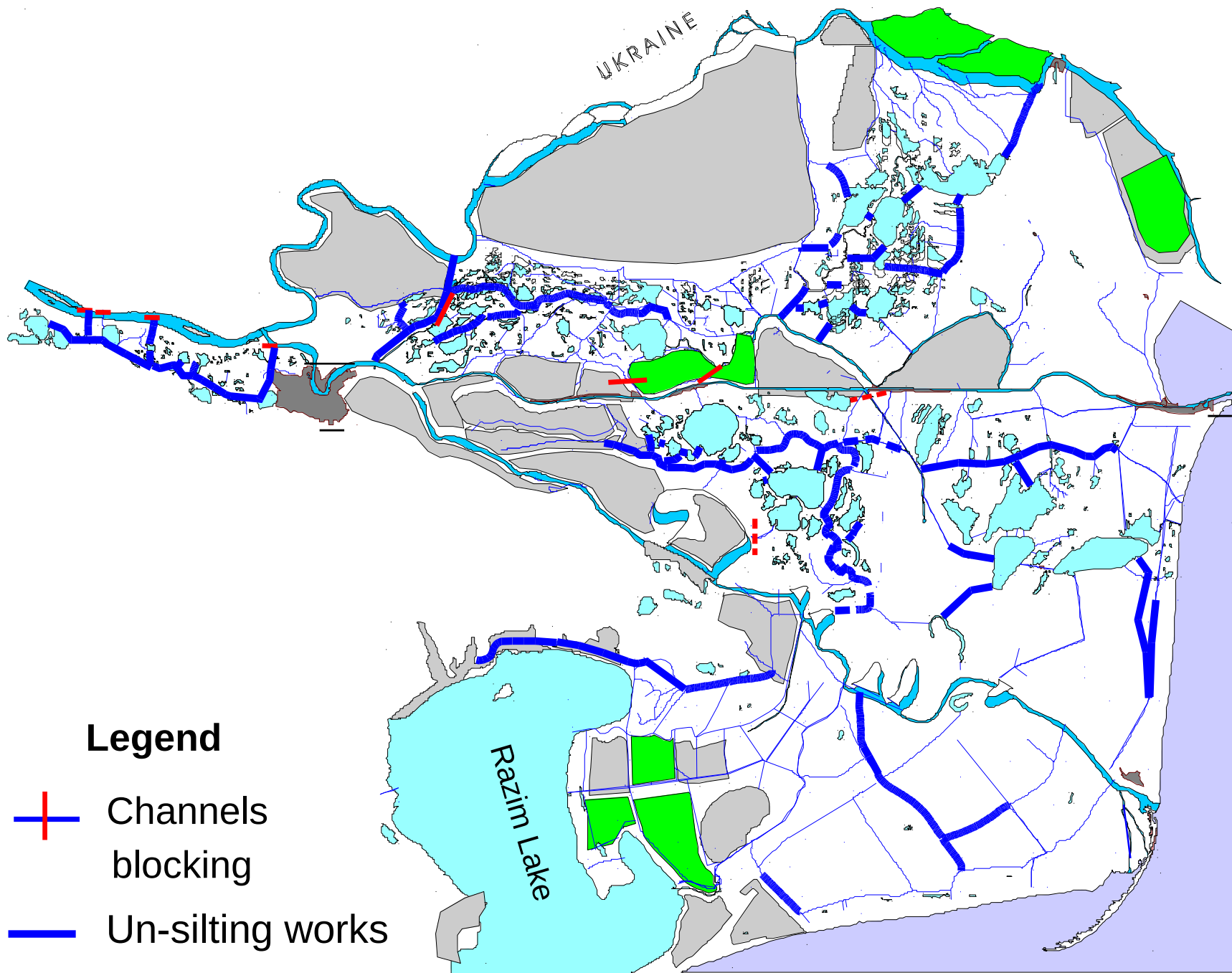


3 islands created as a result of rectification of
Danube arm were proposed to be connected to river

HYDROLOGICAL SYSTEM REHABILITATION

- **Objectives:**
 - close or calibrate the artificial North-South oriented canals
 - calibrate the (semi-)natural West-East channels
 - calibrate the lake entrances

From 3,400 km of channels 329.5 km have been dragged, 8 canals closed and 5 sections calibrated



DANUBE DELTA RESEARCH & DESIGN INSTITUTE

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DANUBE DELTA BIOSPHERE RESERVE AUTHORITY

AWARDS FOR
ECOLOGICAL RESTORATION



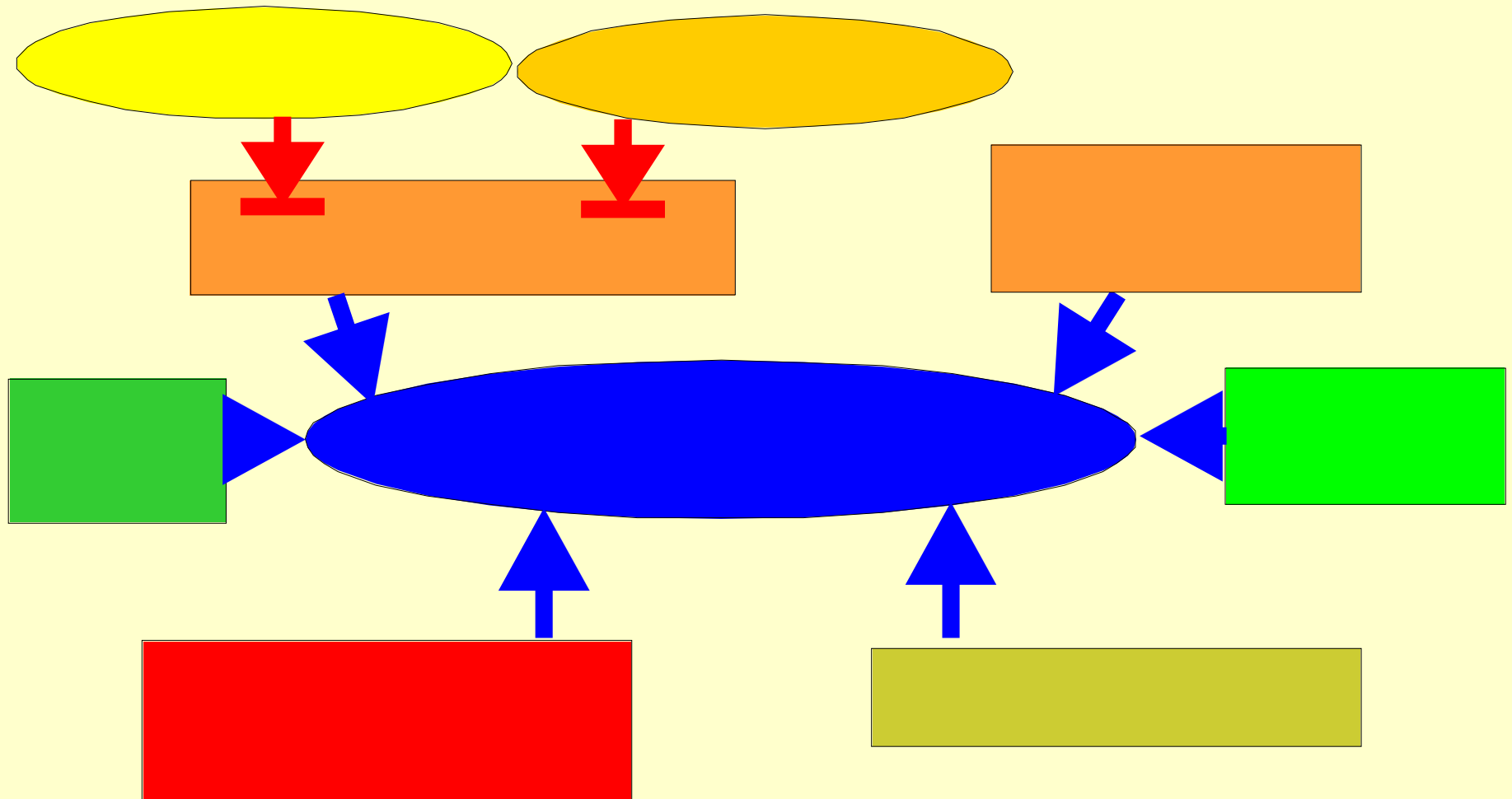
A G I R AWARD - 1995
**GENERAL ASSOCIATION OF
ROMANIAN ENGINEERS**

EUROSITE AWARD -1995
EUROPEAN COMMUNITY



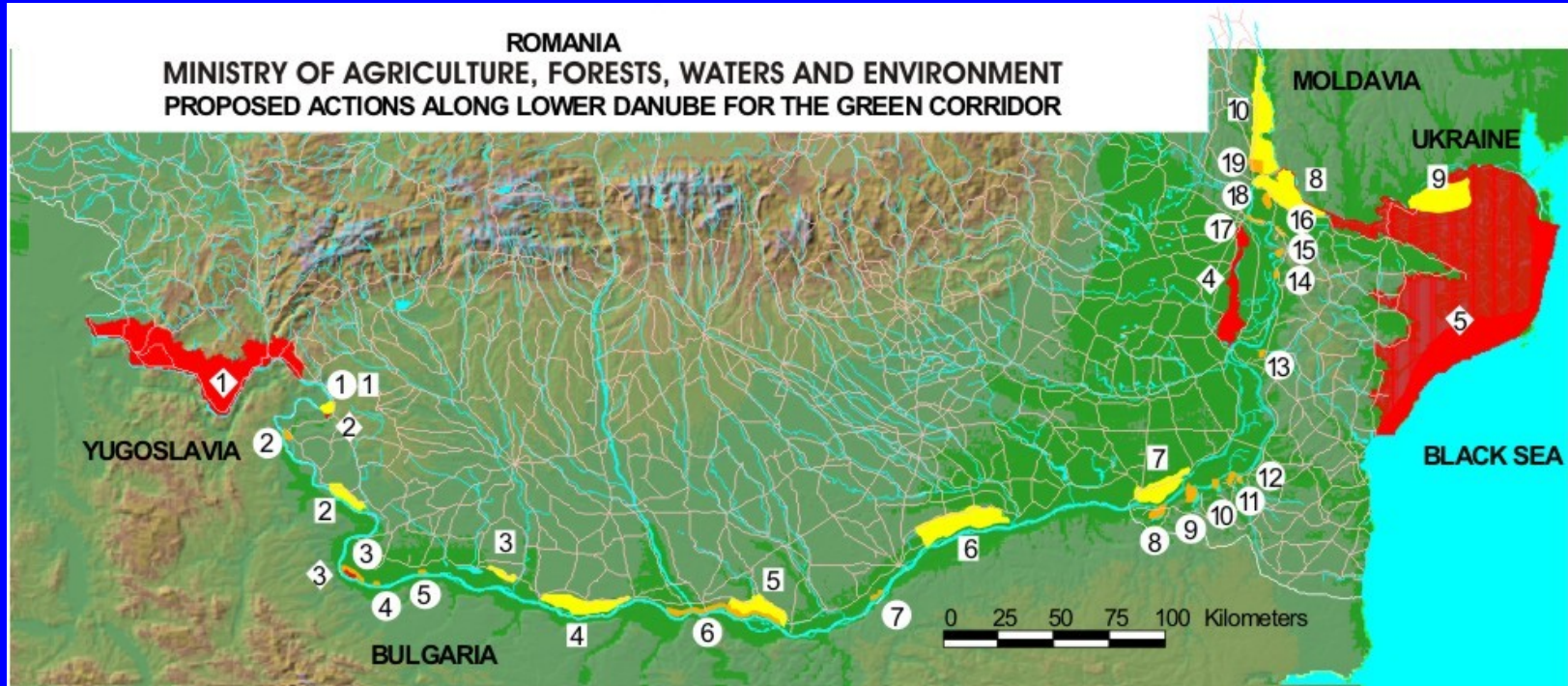
WWF CONSERVATION MERIT AWARD -1996
WORLD WIDE FUND FOR NATURE (WWF)

ENCOUNTERED CONSTRAINTS



FUTURE PROSPECTIVES

ROMANIA MINISTRY OF AGRICULTURE, FORESTS, WATERS AND ENVIRONMENT PROPOSED ACTIONS ALONG LOWER DANUBE FOR THE GREEN CORRIDOR



- ◆ Existing protected areas:
1. Iron Gates Natural Park (115656 ha)
 2. Starmina Forest (310 ha)
 3. Ciuperceni - Desa Natural Reserve (200 ha)
 4. Small Island of Braila Natural Park (17529 ha)
 5. Danube Delta Biosphere Reserve (580000 ha)

LEGEND

- waters
- roads
- existing protected areas
- proposed protected areas
- areas proposed for reconstruction

- New areas planned to be studied in order to be declared as protected areas:
1. Hanova - Ostrovul Corbului (1980 ha)
 2. Ostrovul Mare - Ostrovul Turcesc (230 ha)
 3. Ciuperceni - Rast (2590 ha)
 4. Pietris Islet (26 ha)
 5. Vana Islet (105 ha)
 6. Danube sector km. 587 - 636 (4863 ha)
 7. Cama Dinu Islets (196 ha)
 8. Bugeac Lake (1400 ha)
 9. Olina Lake (2509 ha)
 10. Mirleanu Lake (550 ha)

11. Vederosa Lake (230 ha)
12. Baci Lake (200 ha)
13. Hazarlic Lake (268 ha)
14. Peceneaga Swamp (40 ha)
15. Turcoaia Ponds (310 ha)
16. Sarat and Slatina lakes (150 ha)
17. Macin - Smardan Swamp (230 ha)
18. Jijila Lake (2500 ha)
19. Brates Lake (2111 ha)

- Proposed areas for ecological reconstruction
1. Blahnitei Plain - Corbului Islet (1981 ha)
 2. Garla Mare - Saldia (1681 ha)
 3. Bistret-Nedeia-Jiu Endosure (1080 ha)
 4. Arranged Complex Potelu (23330 ha)
 5. Arranged Complex Suhaia (17490 ha)
 6. Arranged Complex Greaca (33819 ha)
 7. Calarasi-Rau Islet (13050 ha)
 8. Arranged Complex Crapina (10000 ha)
 9. Arranged Complex Pardina (27052 ha)
 10. Lower Prut Area (32400 ha)

**AGRICULTURAL POLLUTION CONTROL
WITH FINANCIAL SUPPORT OF ROMANIAN GOVERNMENT
AND GEF / WORLD BANK**

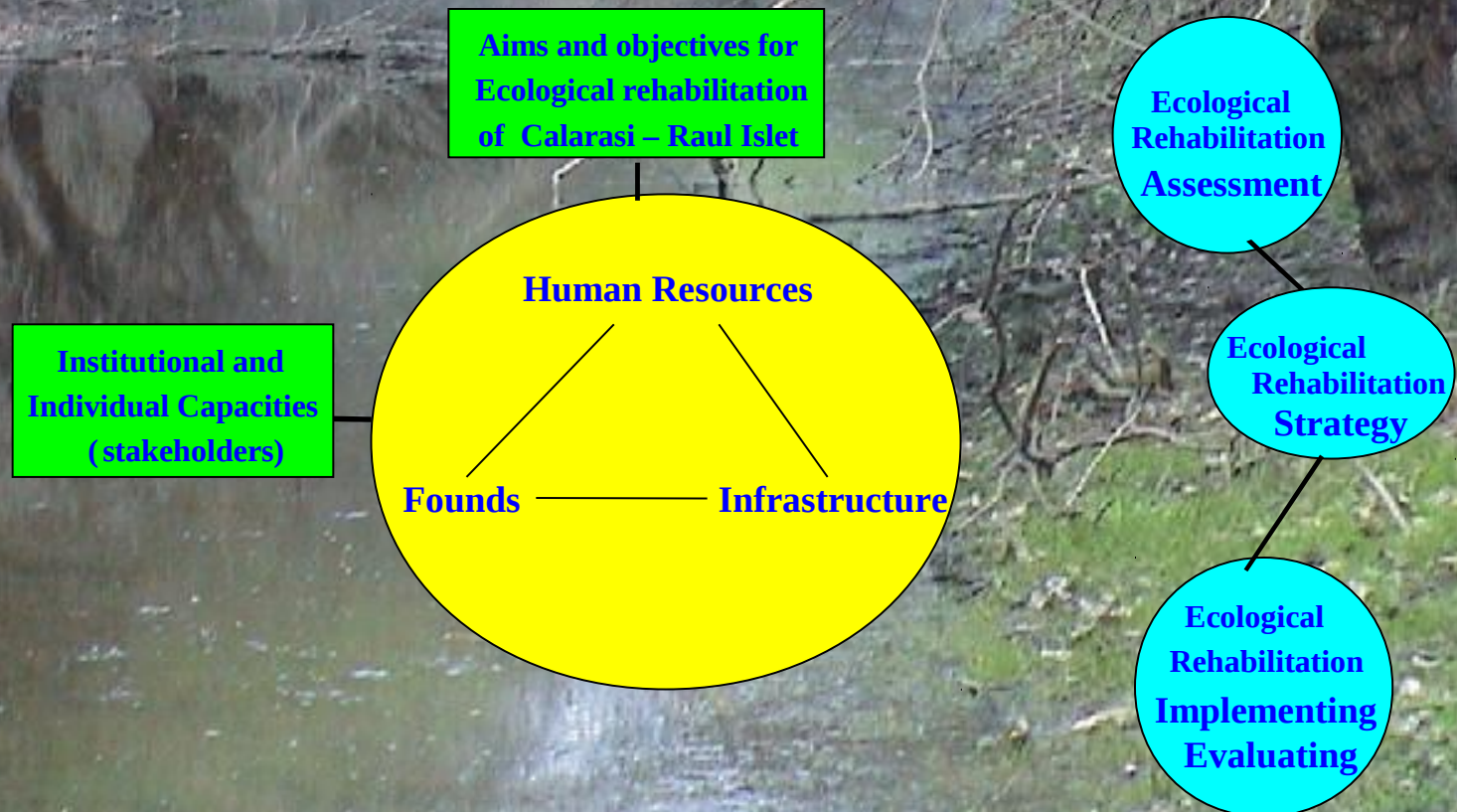
**PILOT PROJECT OF ECOLOGICAL
RESTORATION
CALARASI – RAUL ISLET S=3,875HA**

**GREEN CORRIDOR
OF LOWER DANUBE FLOODPLAIN
ROMANIAN SECTOR**



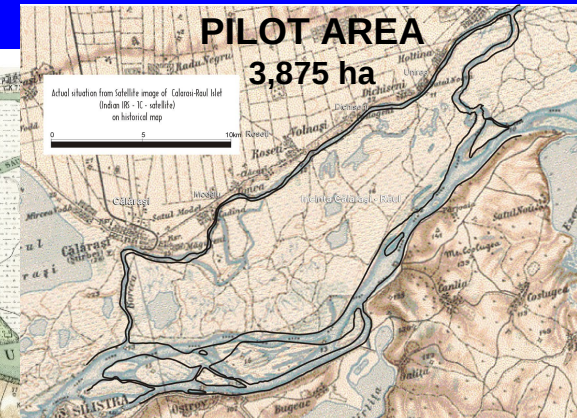
Objectives

- **Restore and preserve the specific biodiversity of the Calarasi-Raul Islet**
- **Benefits for population in the area by increasing of the employment and the development of traditional activities: fishing, reed harvesting, wood cutting and tourism**



RESULTS

- GENERAL STRATEGY FOR ECOLOGICAL REHABILITATION OF *CALARASI-RAUL* ISLET
- COMPLET PROJECT FOR REHABILITATION OF *CALARASI-RAUL* PILOT AREA
- IMPLEMENTATION PLAN
- INVESTMENTS COST-PLAN
- BIOLOGICAL AND HYDROLOGICAL MONITORING



MANAGEMENT PLAN FOR CONSERVATION OF NATURAL RESERVE IEZER – CALARASI

- LOCAL POPULATION OF WILD SPECIES PROTECTION
- NATURAL HABITATS REHABILITATION
- BIODIVERSITY CONSERVATION
- ECOLOGICAL EQUILIBRIUM MAINTAINING



RESULTS

- **BASEMENT STUDY TO PROMOTE *IEZER-CALARASI* AREA AS NATURAL RESERVE**
- **MANAGEMENT PLAN OF CONSERVATION**
- **ECOLOGICAL REHABILITATION PROGRAM**
- **STRATEGIES FOR PUBLIC AWARENESS AND RESEARCH**
- **IMPLEMENTATION PLAN**

A photograph of a pond with several large, green lily pads floating on the water. A single white lily flower with yellow stamens is in bloom in the center. The text "THANK YOU" is overlaid in yellow capital letters at the bottom.

THANK YOU