

Long Term Ecological Research in the Upper Paraná River Floodplain, Brazil: main patterns and variations:

Session on “Role of Flow and Hydrologic Connectivity in
Floodplain and Wetlands Ecosystems”

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Angelo Antonio Agostinho
Luiz Carlos Gomes
Horácio Ferreira Júlio Jr
Sidinei Magela Thomaz
Universidade Estadual de Maringá
agostinhoaa@nupelia.uem.br

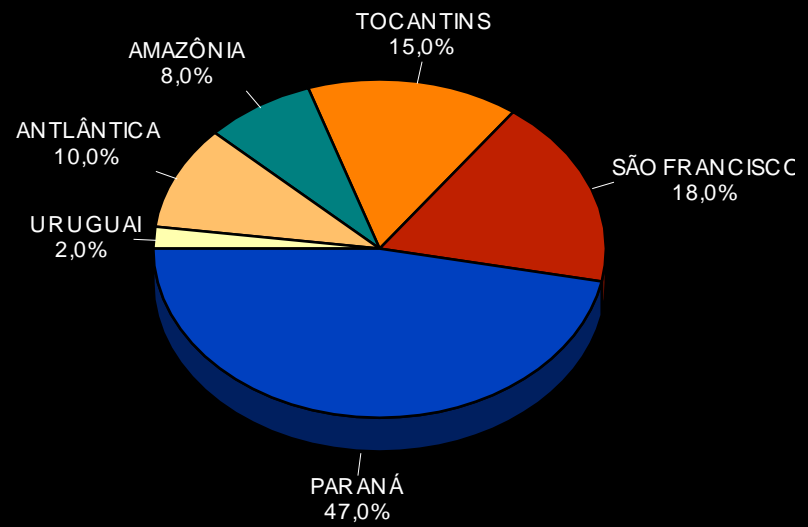


Structure of the presentation

- The upper Paraná River
 - Biodiversity
 - Impoundments
- Main impacts on the ecosystem functioning
 - Losses in floodable area
 - Connectivity
 - Nutrients and sediment retention
- Perspective for the future

The upper Paraná River

- Largest industrial center in South America
- Intensive agriculture and ranching
- High density of human population
 - 36% of Brazilian population
- Impoundments



Flooding



Low water season (Oct 1996)



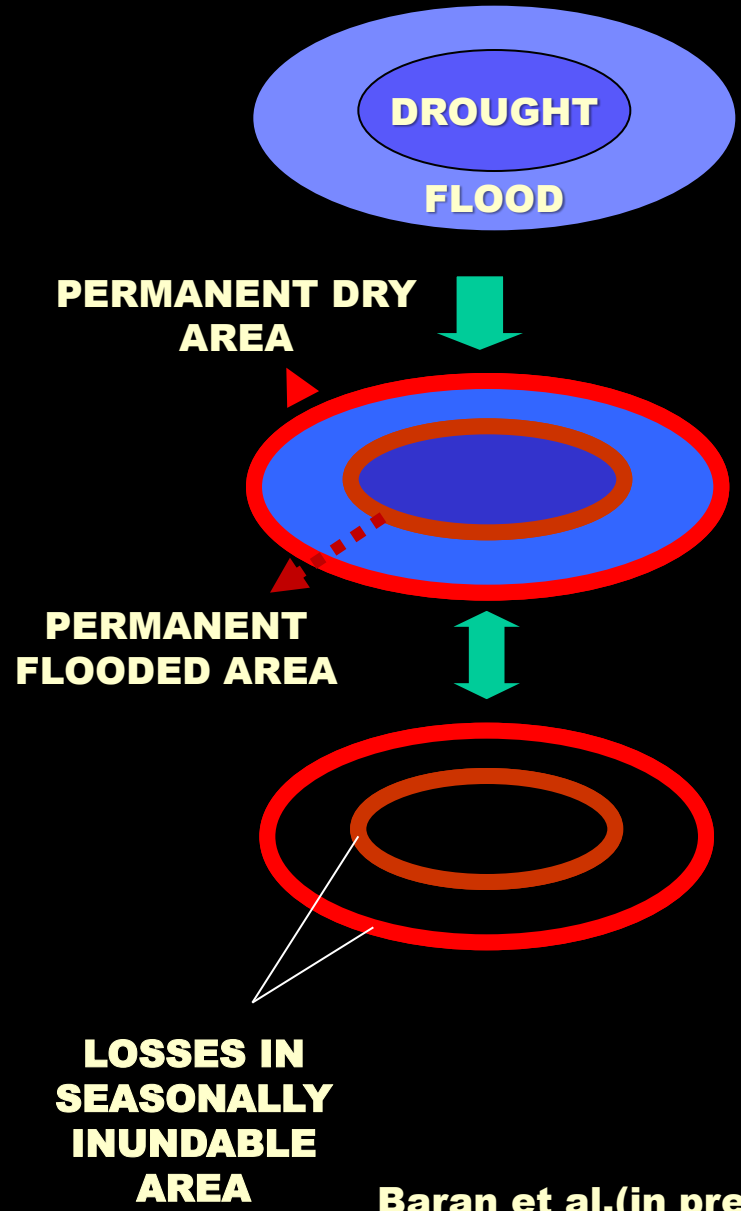
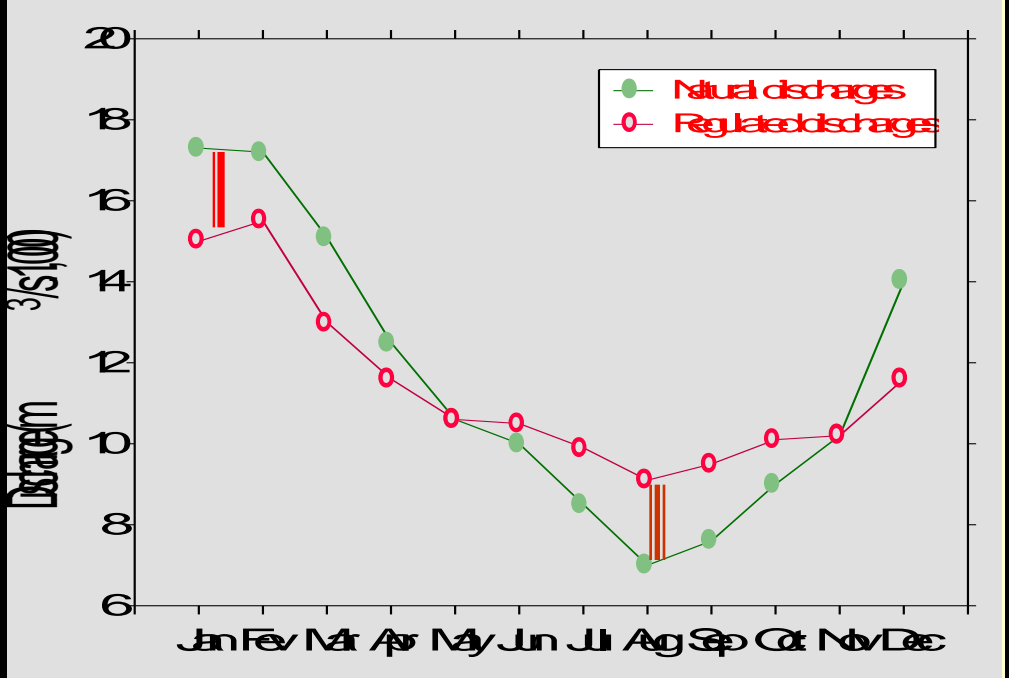
High water season (Jan 1990)

Biodiversity

• Plants	774	
• Aquatic macrophytes	155	
• Phytoplankton	690	
• Periphyton	824	
• Zooplankton (+ciliates+rotifers)	866	
• Benthic invertebrates (+Ostracods)	315	
• Ictioparasites	337	
• Fishes	170	
• Amphibian	22	
• Reptiles	37	
• Birds	295	
• Mammals	60	
• TOTAL	4545	

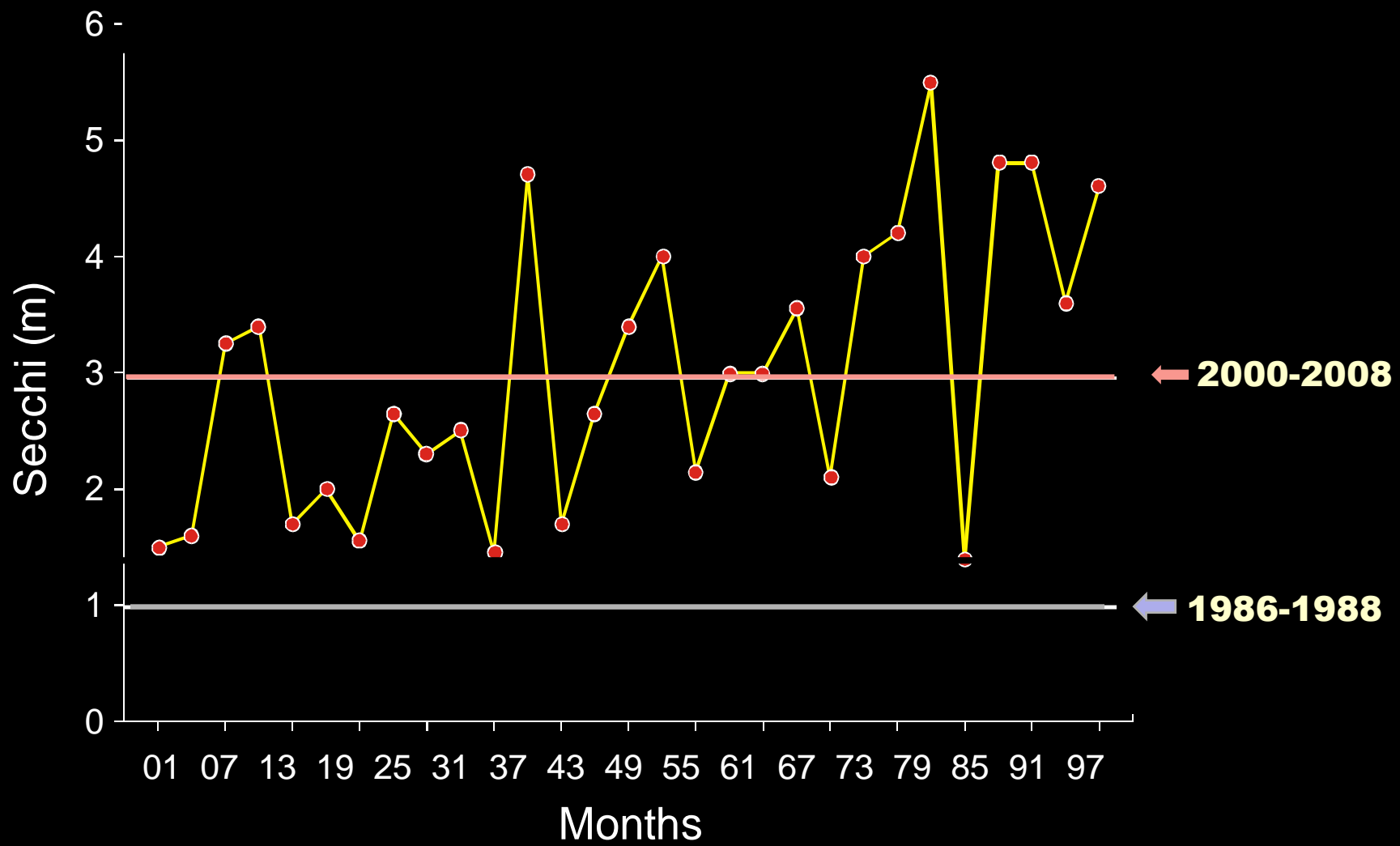
Main Impacts

Redistribution of the seasonal discharge promoted by dams provoked losses in floodable area and altered connectivity among the plain components



Baran et al.(in prep)

Increase in Secchi Depth due to sediment retention in reservoirs



Habitat alterations

Proliferation of submersed macrophytes



Egeria densa
Egeria najas
Hydrilla verticillata

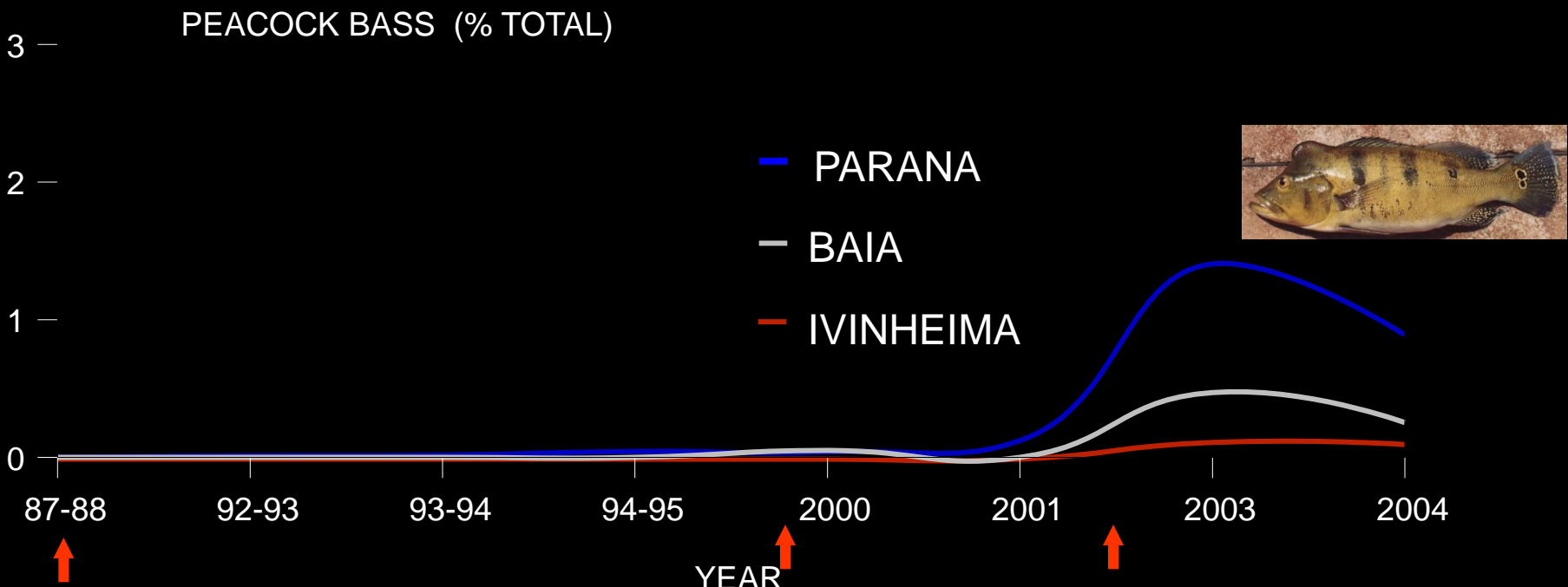
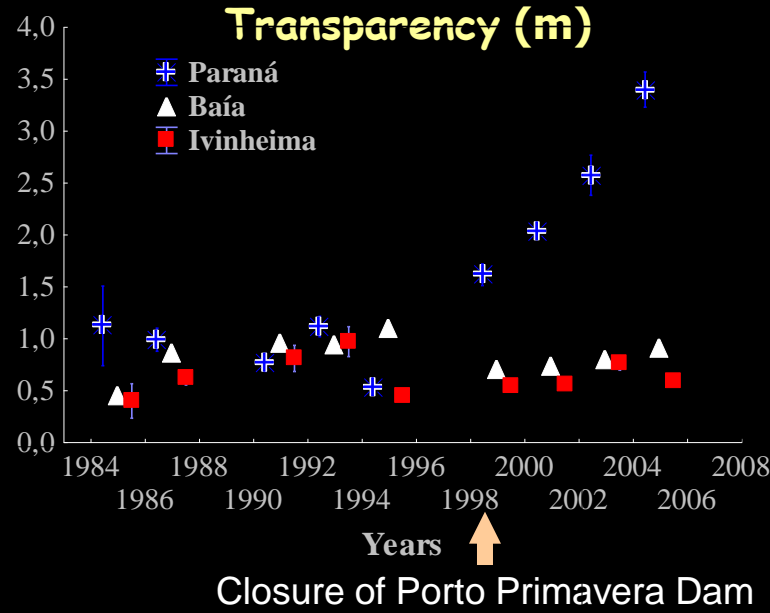


By R.P. Mormul (UEM)

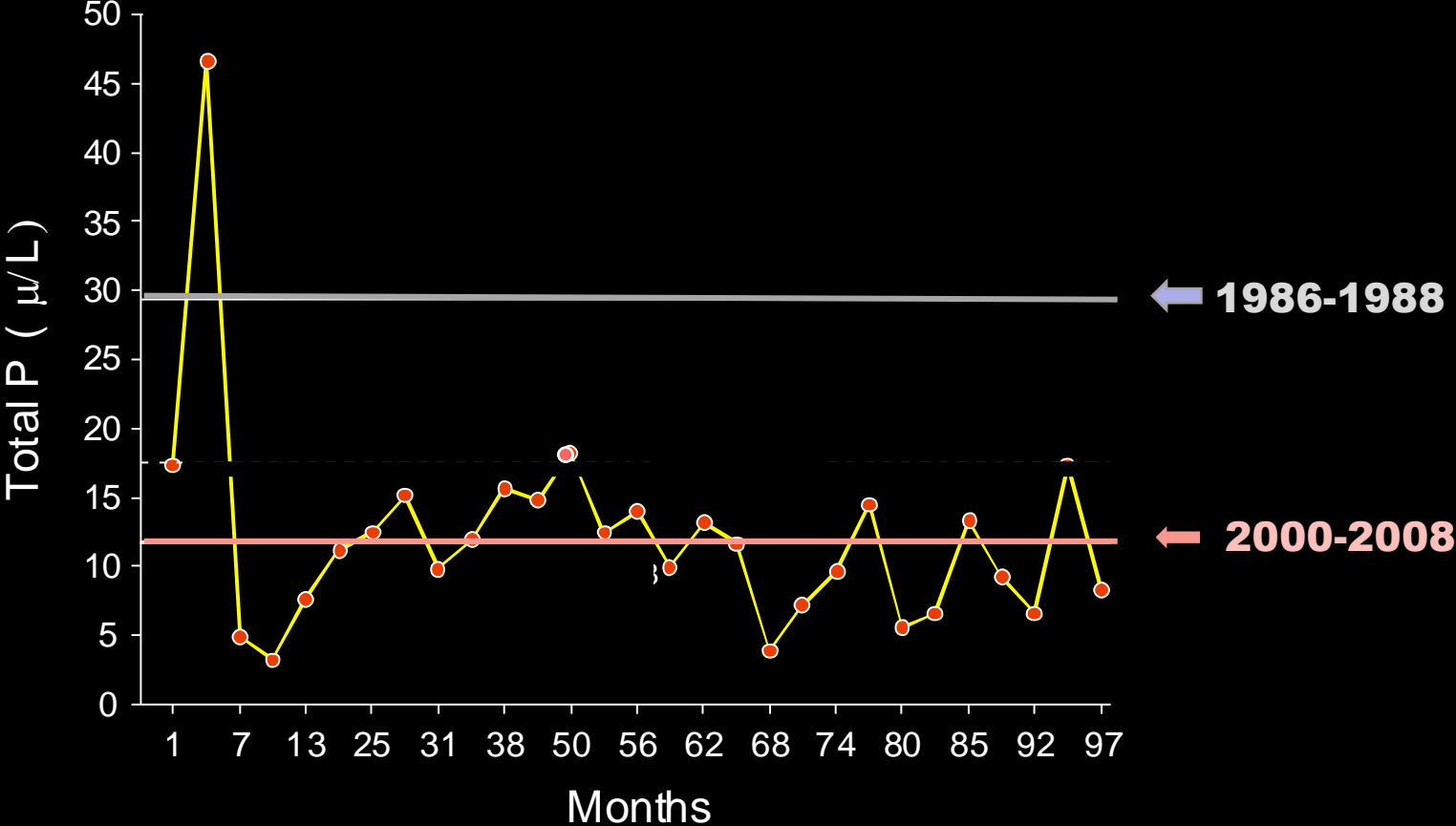


Habitat alterations

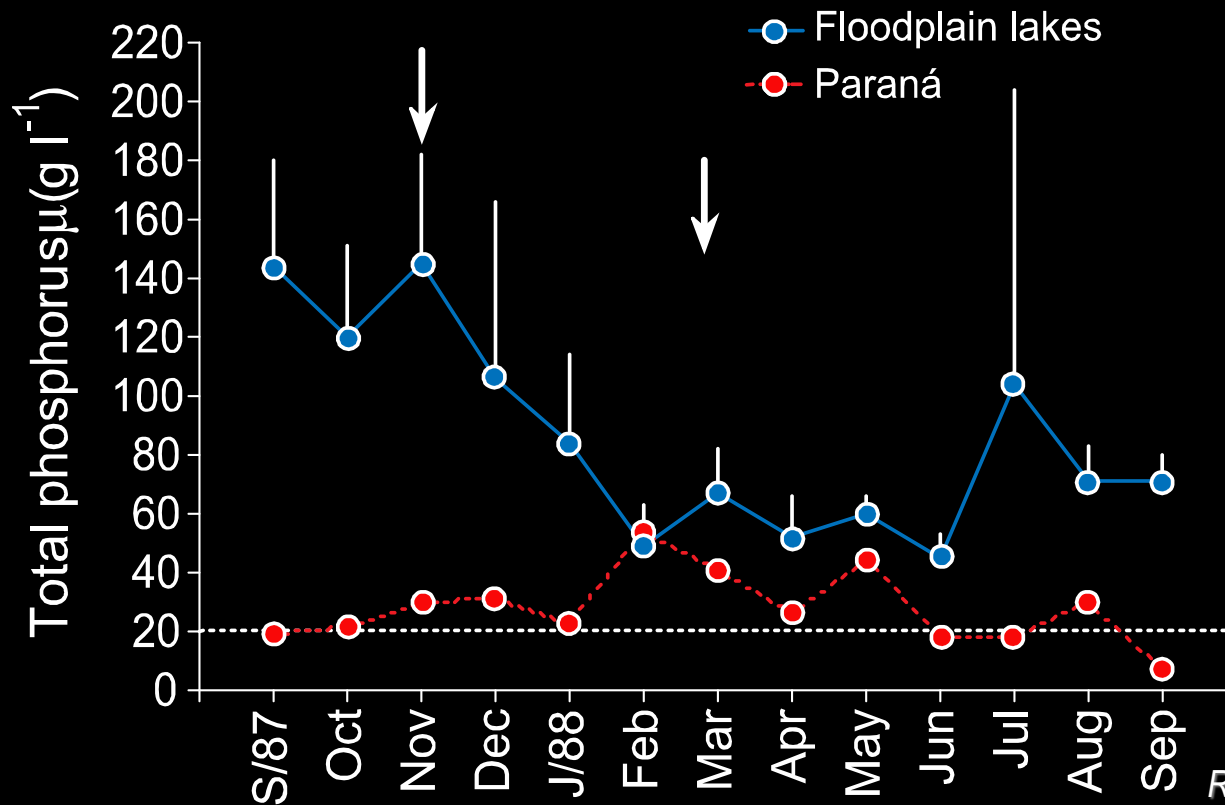
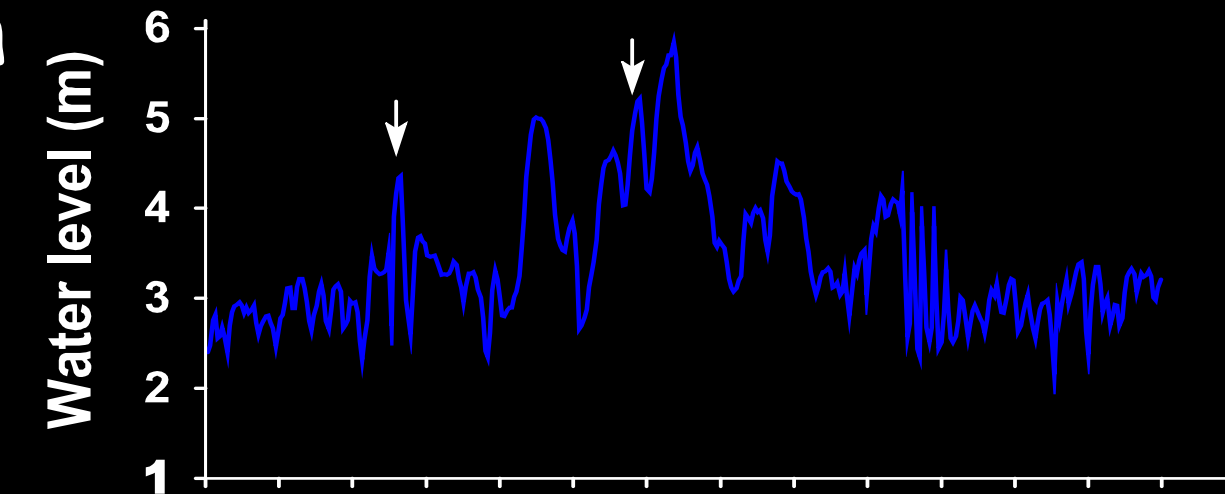
Proliferation of non native species



Nutrients retention by dams

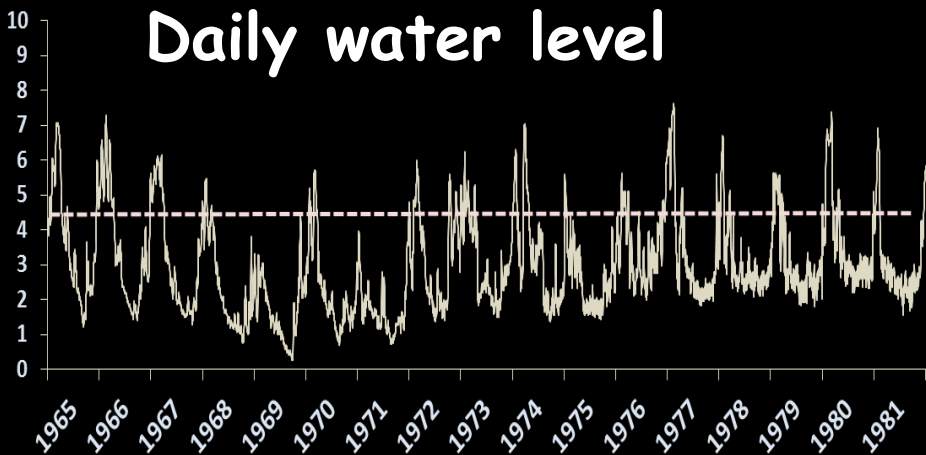


Nutrient retention

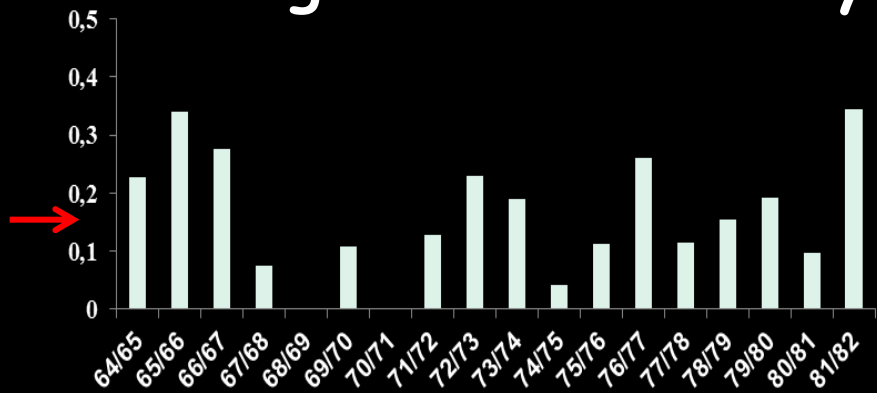


1
9
6
5
-
1
9
8
1

Daily water level

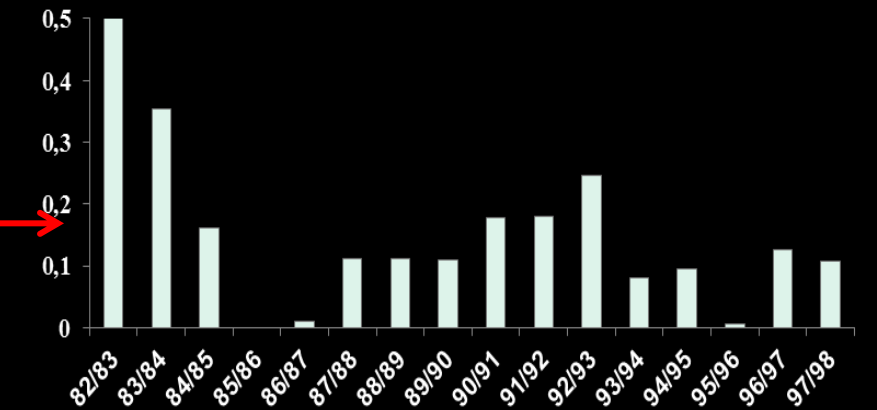
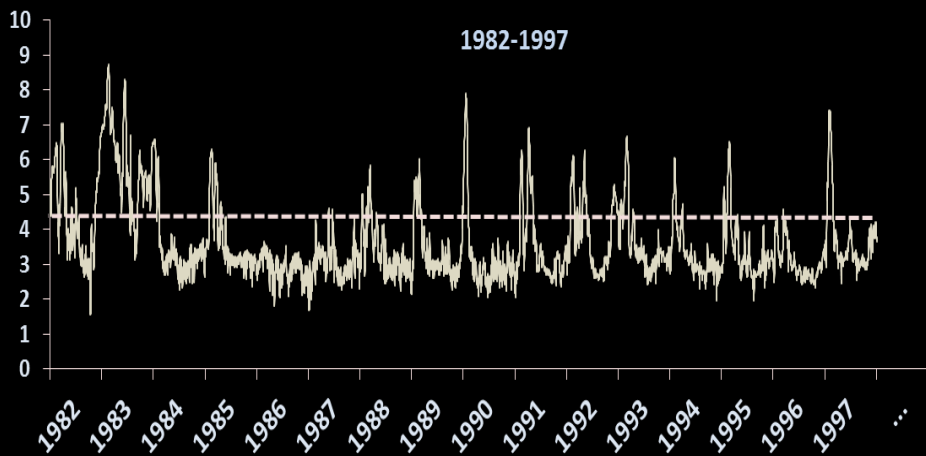


Changes in Connectivity



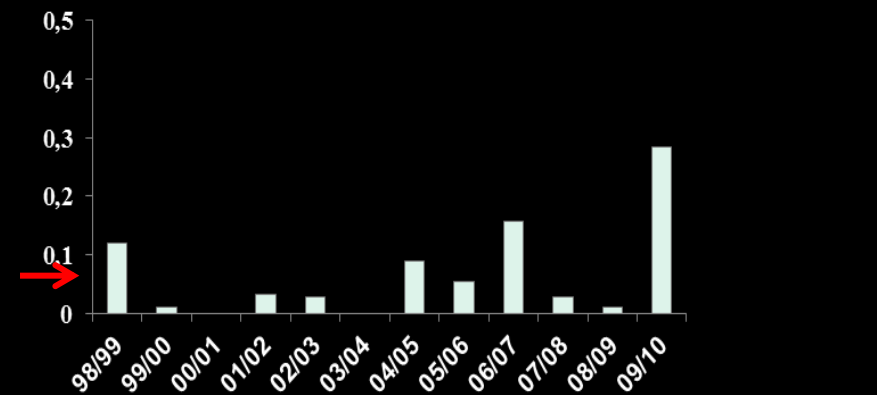
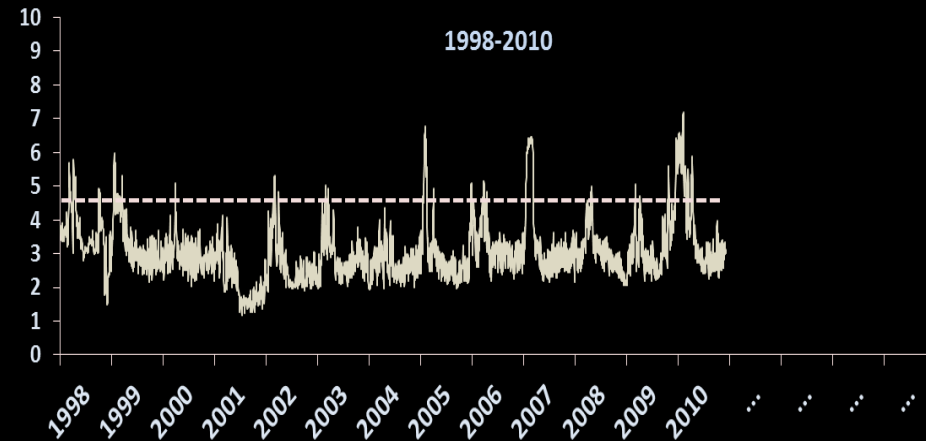
1
9
8
2
-
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7

1982-1997



1
9
9
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2
0
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1
0

1998-2010



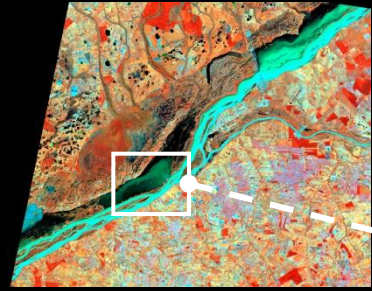
Bank and island erosion

High frequency pulses + sediment retention

Erosion (piping)



Changes in Riverbed

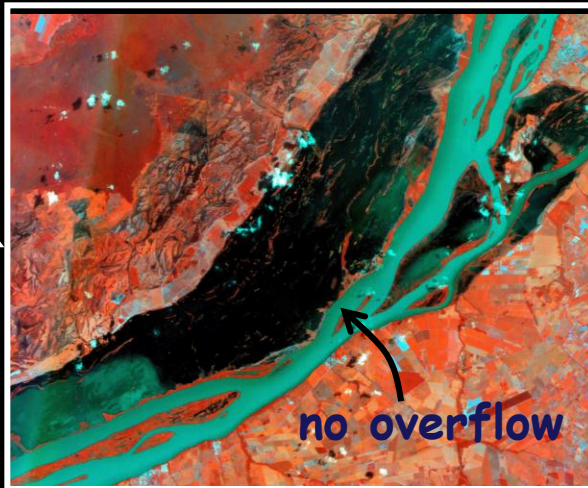


24/03/1985

Discharge:

Day (Mar 24, 1985) = 15,755 m³/s

Maximum (Feb 17, 1985) = 18,200 m³/s



23/02/2007

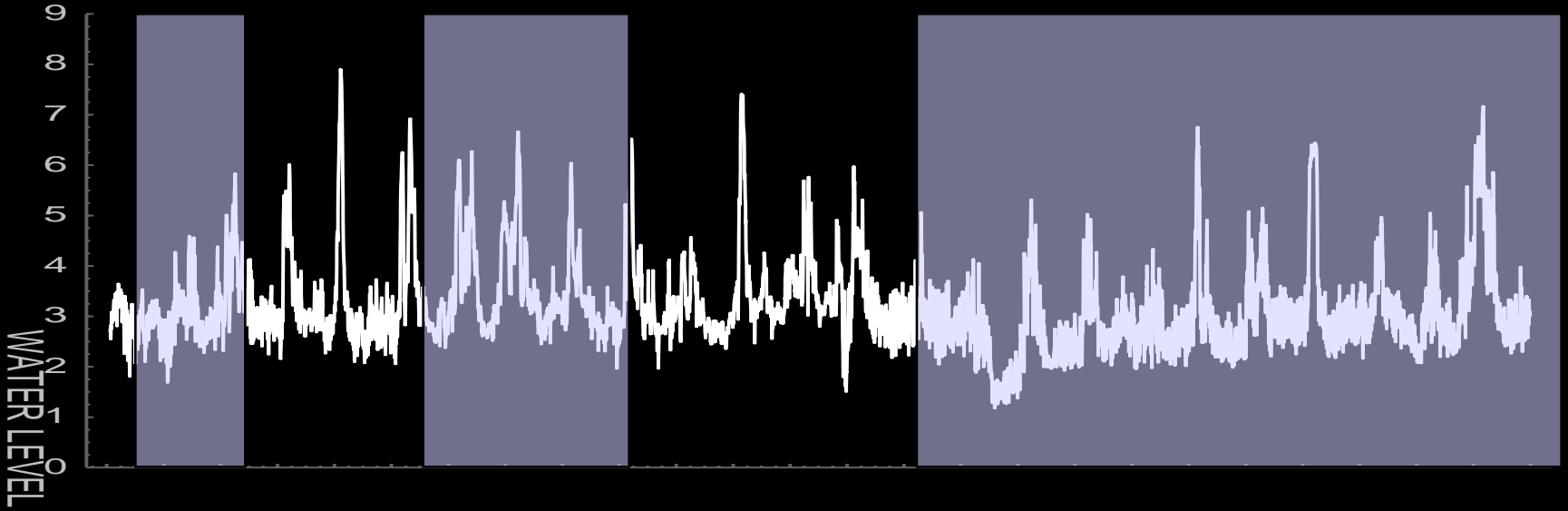
Discharge:

Day (Feb 23, 2007) = 18,733 m³/s

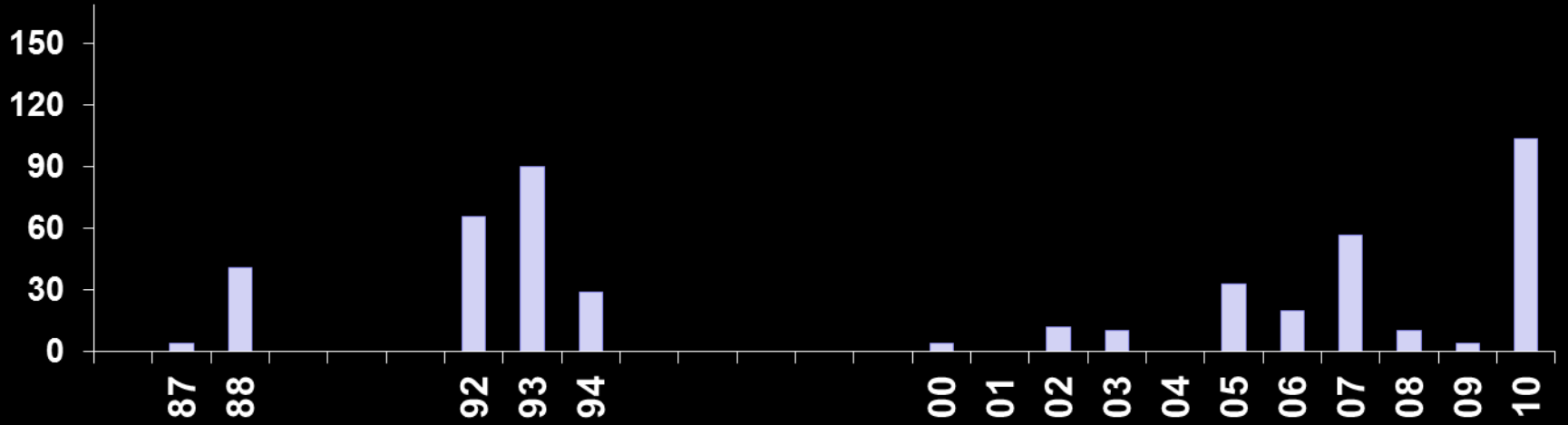
Maximum (Feb 21, 2007) = 18,800 m³/s

Conclusion: More water for the same flood

Water level x Connectivity

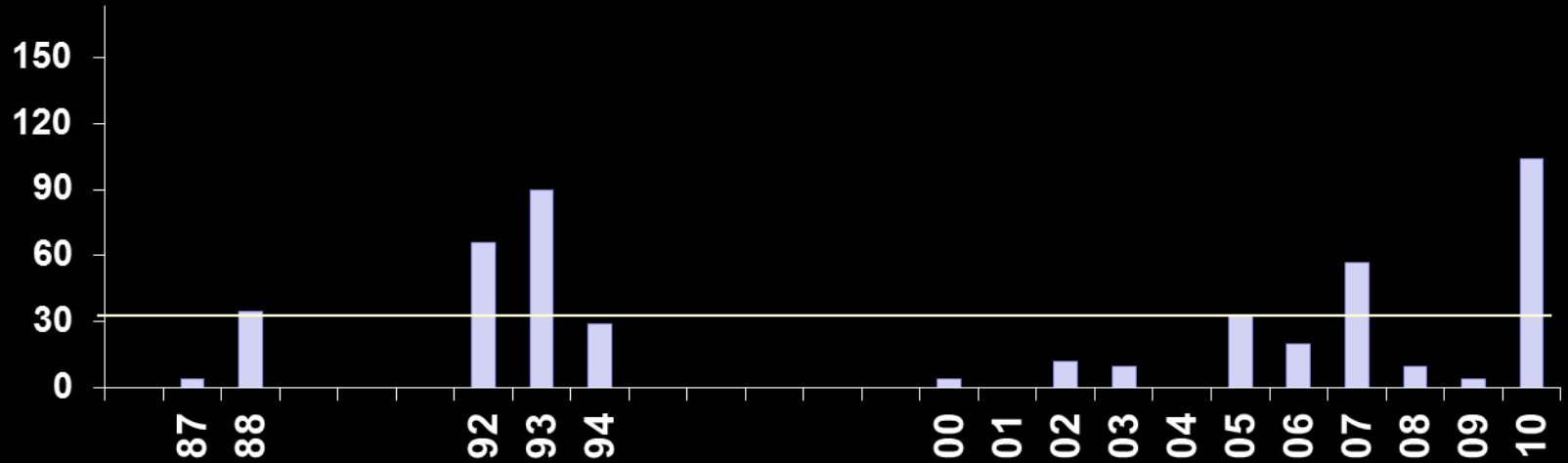


FLOOD DURATION (days)

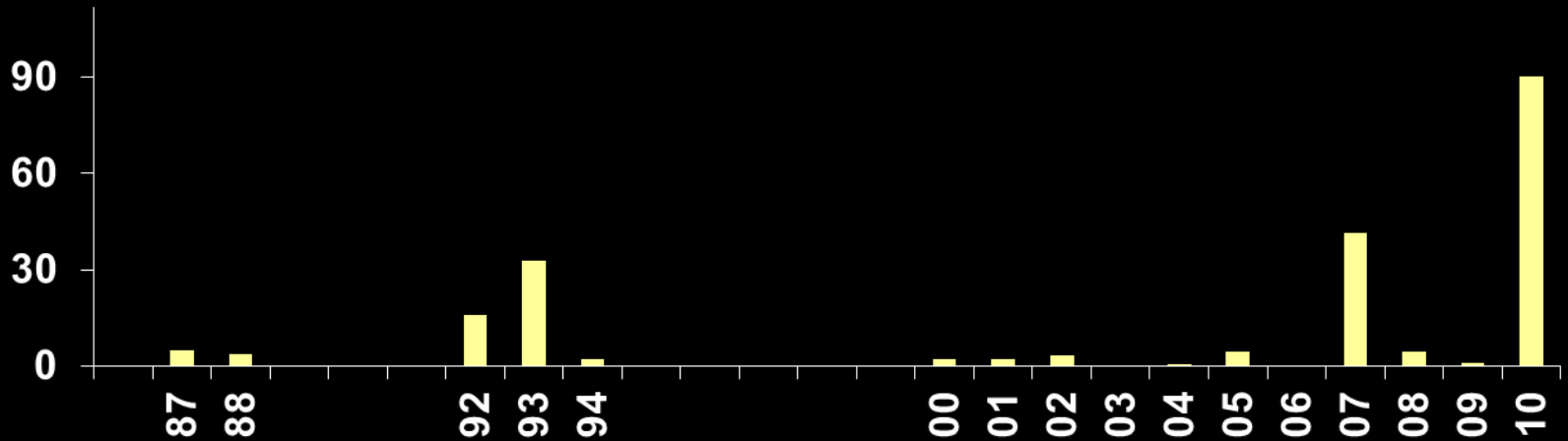


Connectivity x Fish Recruitment

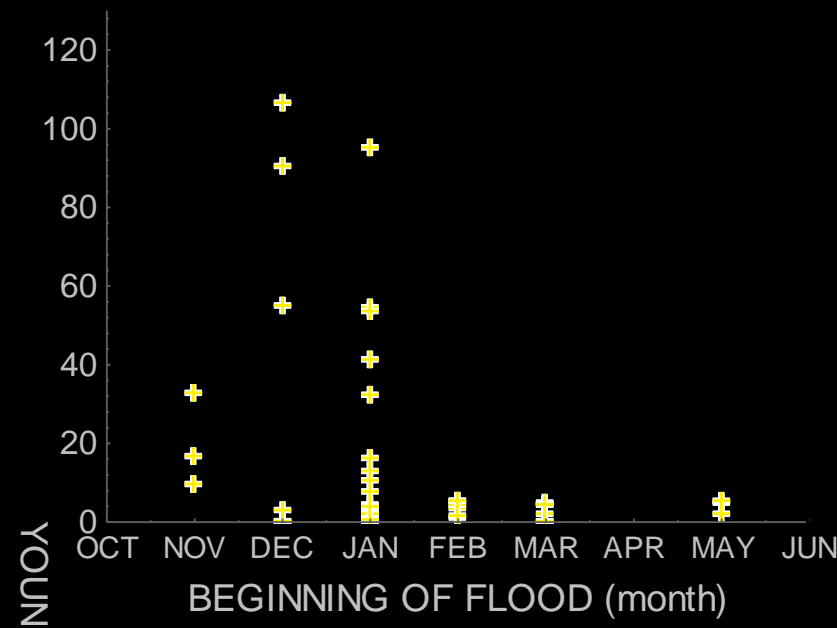
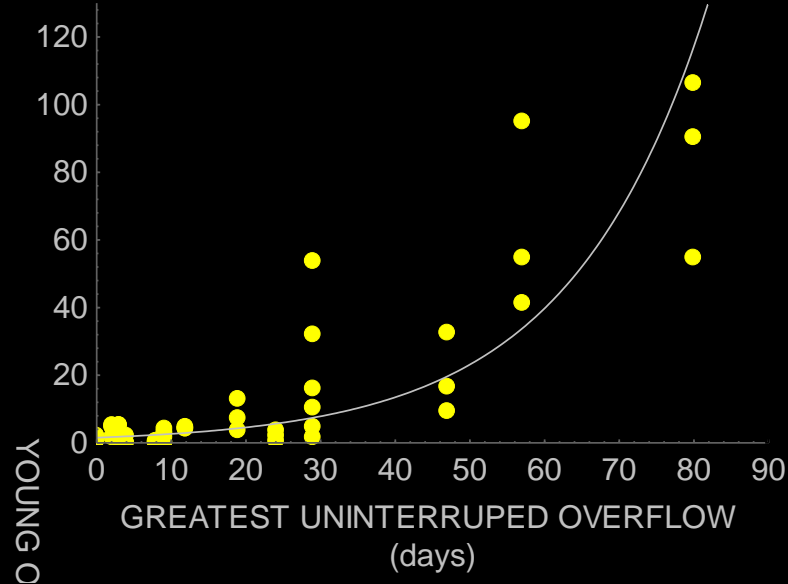
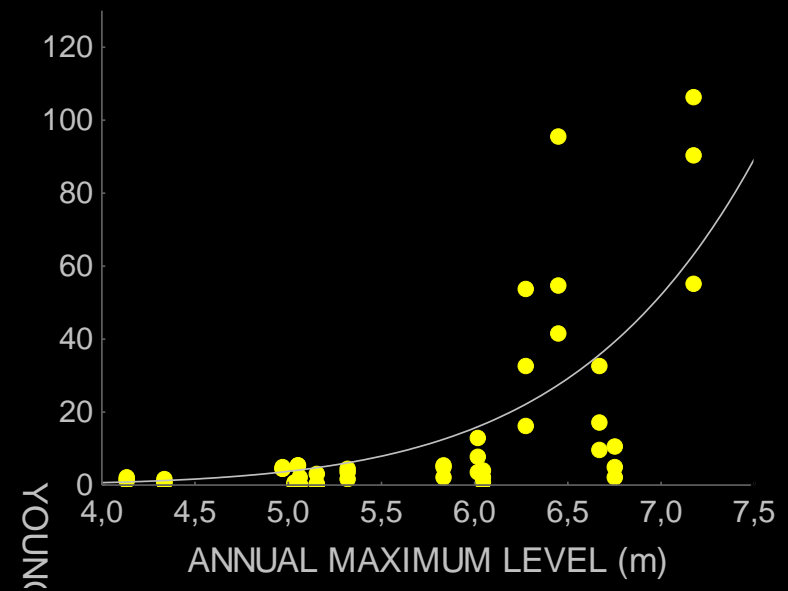
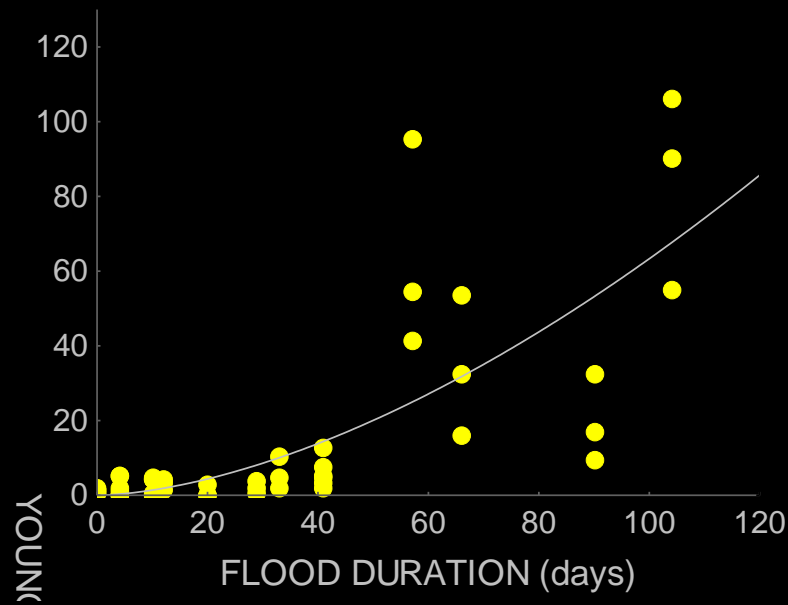
FLOOD DURATION (days)



YOUNGS OF THE YEAR (cpue)



Flood attributes x Fish Recruitment



Flood intensity/duration and fish recruitment

(ANCOVA outcomes)

Factors	F	P	Standardized Slopes
Intensity of potamophase	23.97	<0.0001	0.48
Subsystem	0.04	0.96	
Duration of potamophase 1	24.46	<0.0001	0.42
Subsystem	0.34	0.71	
DP2 * Subsystem	7.86	<0.001	
Paraná	-	<0.01	0.23
Baía	-	<0.001	0.29
Ivinheima	-	<0.0001	0.58
DP3 * Subsystem	3.63	0.03	
Paraná	-	<0.01	0.22
Baía	-	0.03	0.16
Ivinheima	-	<0.0001	0.38
Duration of limnophase	24.47	<0.0001	-0.42
Subsystem	2.27	0.10	

* considering the levels of 450 cm for the Paraná and 275 cm for the Ivinheima

** considering the levels of 540 cm for the Paraná and 325 cm for the Ivinheima

*** considering the levels of 610 cm for the Paraná and 400 cm for the Ivinheima

Socioeconomic and cultural implication

Reduction in fishery income

Itaipu Reservoir

(fishers come from other economic activity,
of the which they were excluded)

Upstream Itaipu Reservoir

(traditional population)

Illicit activity

(smuggling, drug trafficking and
transportation of stolen vehicles
across the border between Brazil
and Paraguay)

Fishery abandonment

(losses in lifestyle, knowledge,
beliefs, feelings and social
relationships)

Increase in criminality

**Losses in cultural
diversity**

Public polices for the region

Regional Conservation Units



Conclusions and Perspectives

- ✓ Impacts to floodplain stretches downstream of dams are related to loss of habitat and/or their deterioration (besides of blockage of fish migratory routes).
- ✓ This impact are caused by factors linked to the quality and quantity of water release along the year.
- ✓ Any action for mitigating the impacts should necessarily consider the manipulation of reservoir discharge, in order to meet habitat, biota, social, economic and cultural demands.

A serene landscape photograph of a lake at sunset. The sky is filled with soft, golden light and scattered clouds. The sun is low on the horizon, casting a warm glow across the water. In the foreground, there are silhouettes of trees and reeds, some of which are reflected in the calm water. The overall mood is peaceful and contemplative.

Thank you !!!