

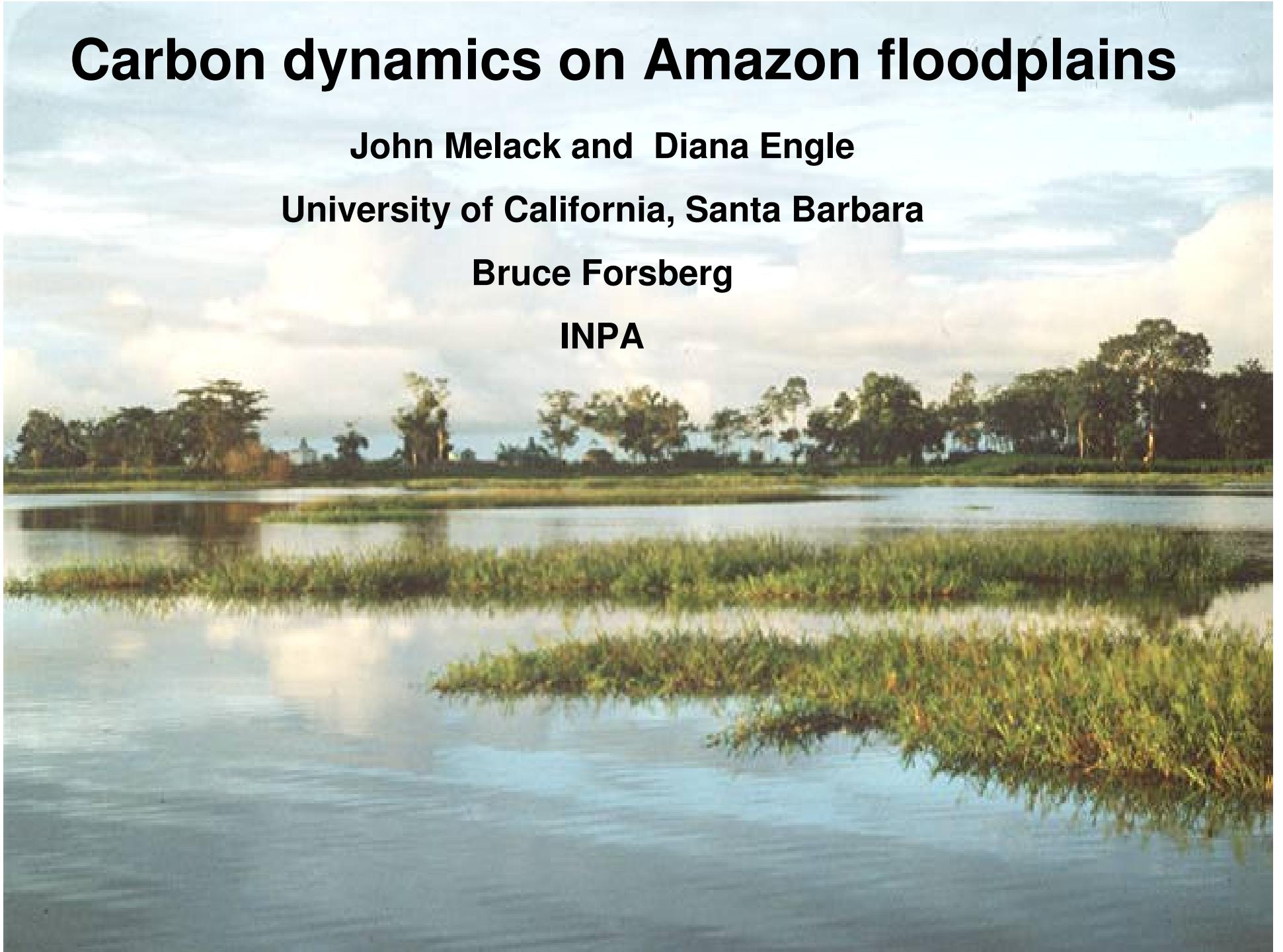
# **Carbon dynamics on Amazon floodplains**

**John Melack and Diana Engle**

**University of California, Santa Barbara**

**Bruce Forsberg**

**INPA**



# **Key aspects of floodplain systems**

**Amplitude, frequency, predictability  
and sources of flooding**

**Vegetative cover and extent of open water**

**Connectedness of components**



## Flooded forest, woodland and shrubs

Upper and lower left: high water

Lower right: low water

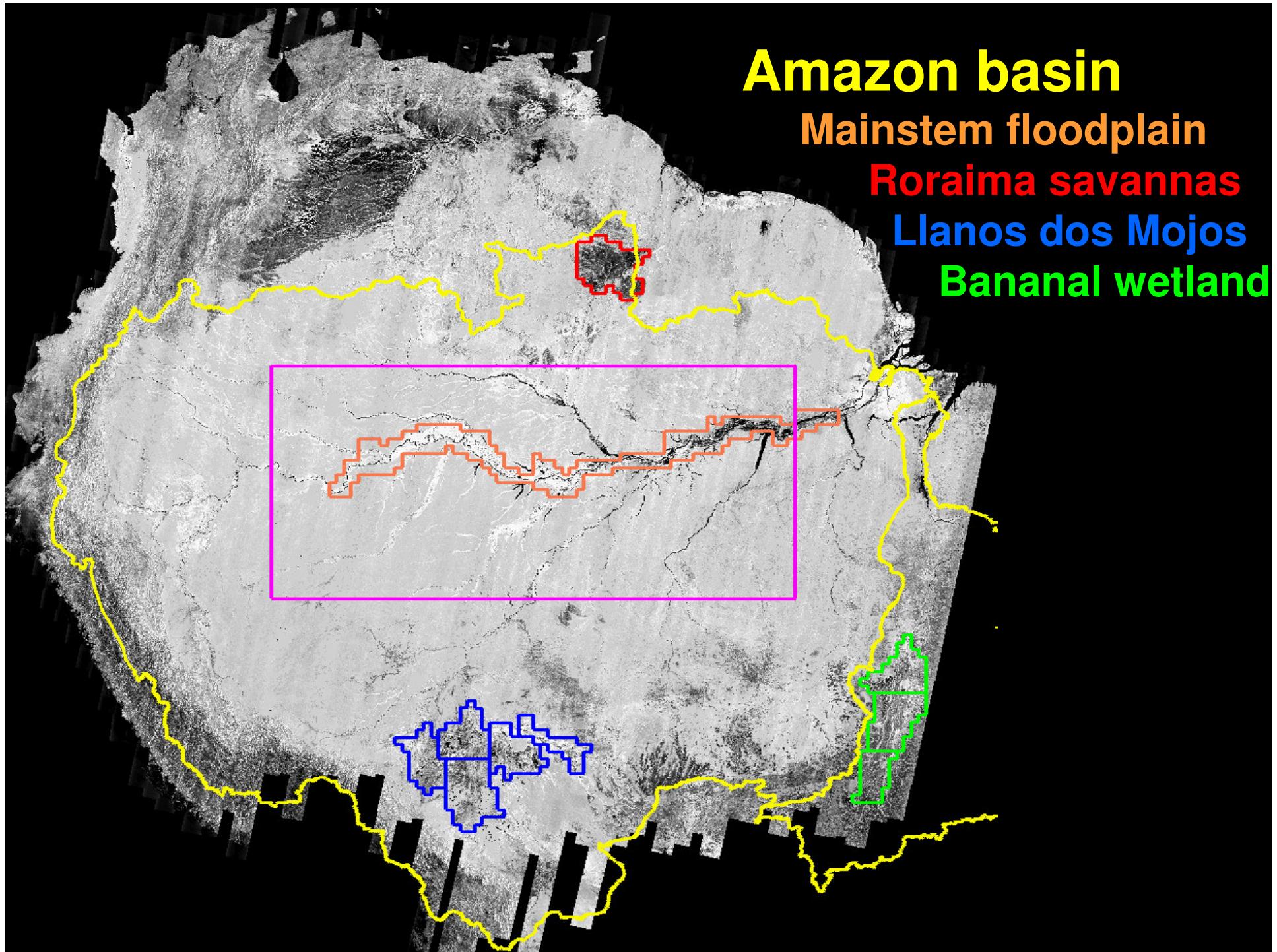


# Aquatic macrophytes



Upper and lower left: high water  
Lower center and right: low water

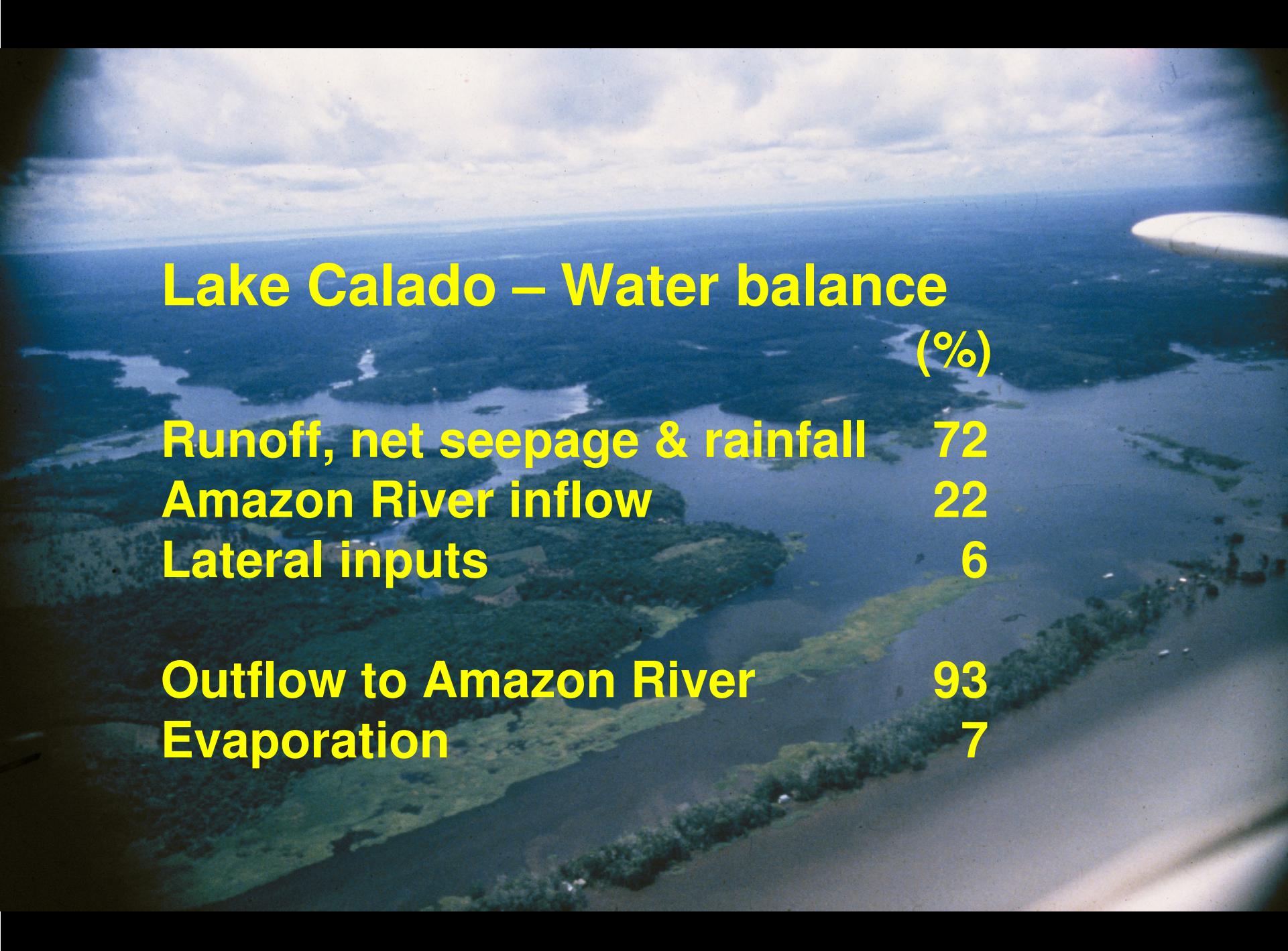




**Amazon basin**  
**Mainstem floodplain**  
**Roraima savannas**  
**Llanos dos Mojos**  
**Bananal wetland**

# Lake Calado

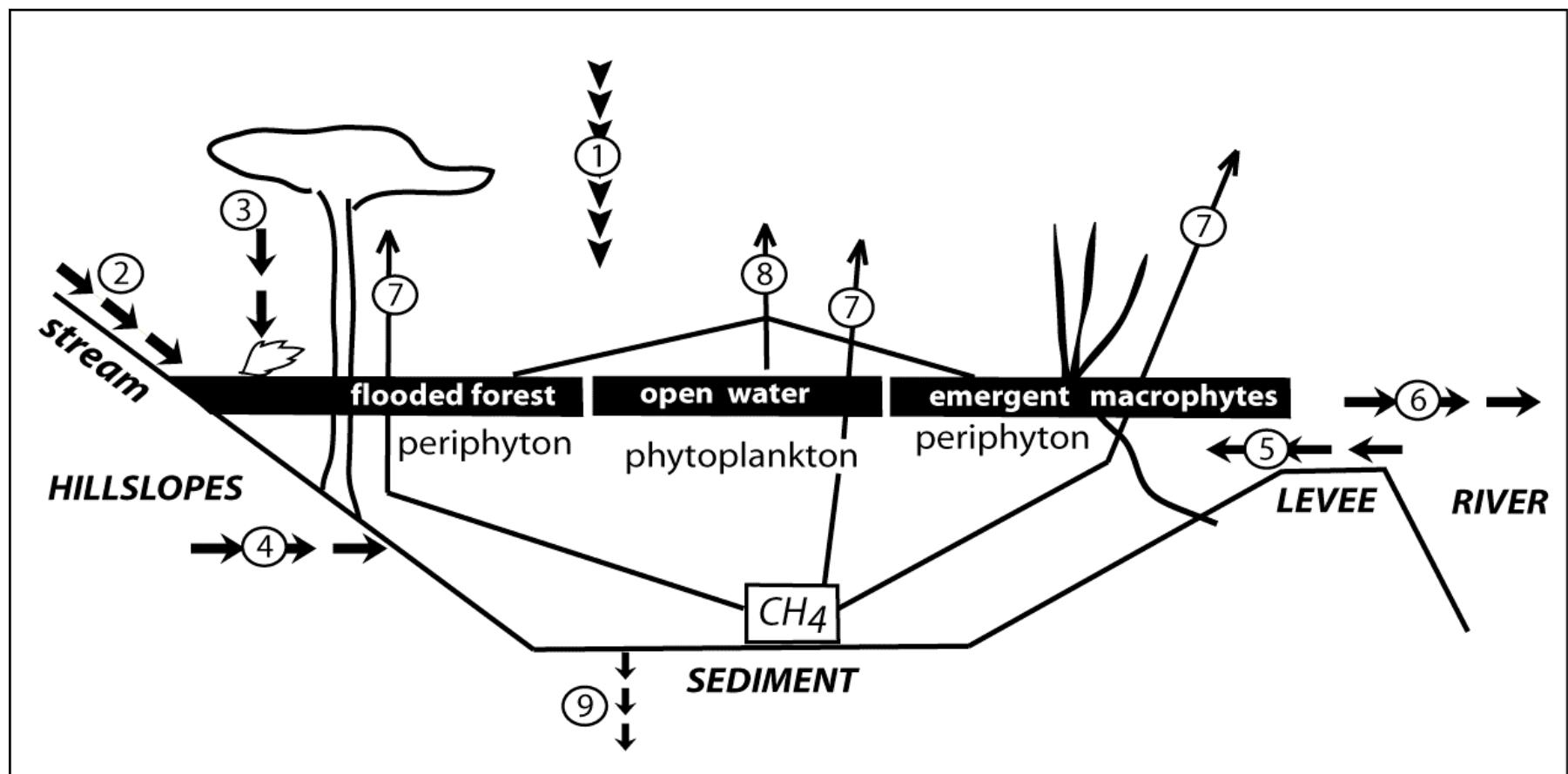


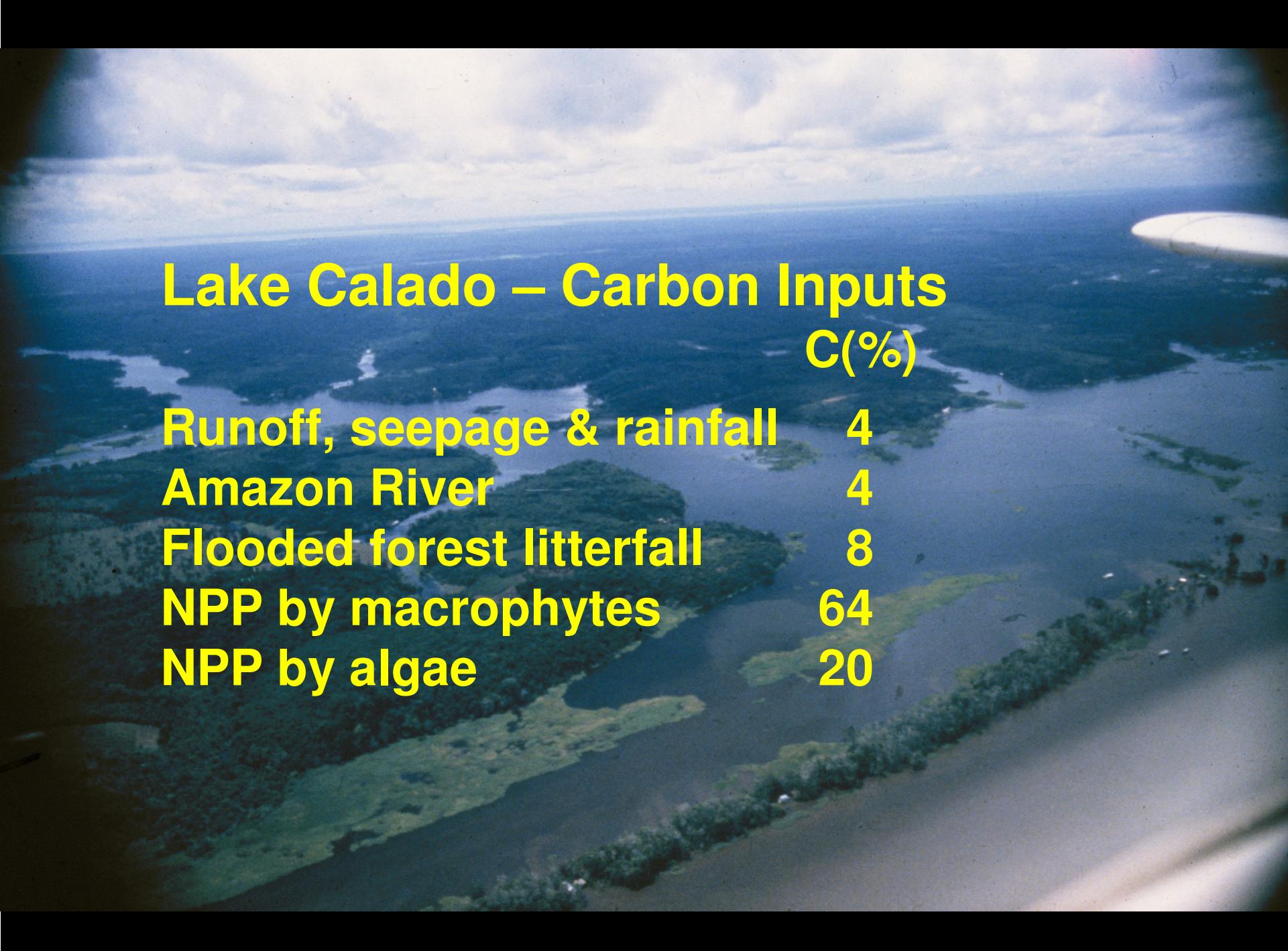
An aerial photograph showing a large, dark blue lake with numerous small white islands or sandbars. A wide river, identified as the Amazon, flows from the bottom left towards the top right, eventually emptying into the lake. The surrounding land is a mix of green vegetation and brown, possibly flooded, areas. The sky is overcast with white clouds.

## Lake Calado – Water balance (%)

Runoff, net seepage & rainfall	72
Amazon River inflow	22
Lateral inputs	6
Outflow to Amazon River	93
Evaporation	7

# Inputs and outputs of organic carbon

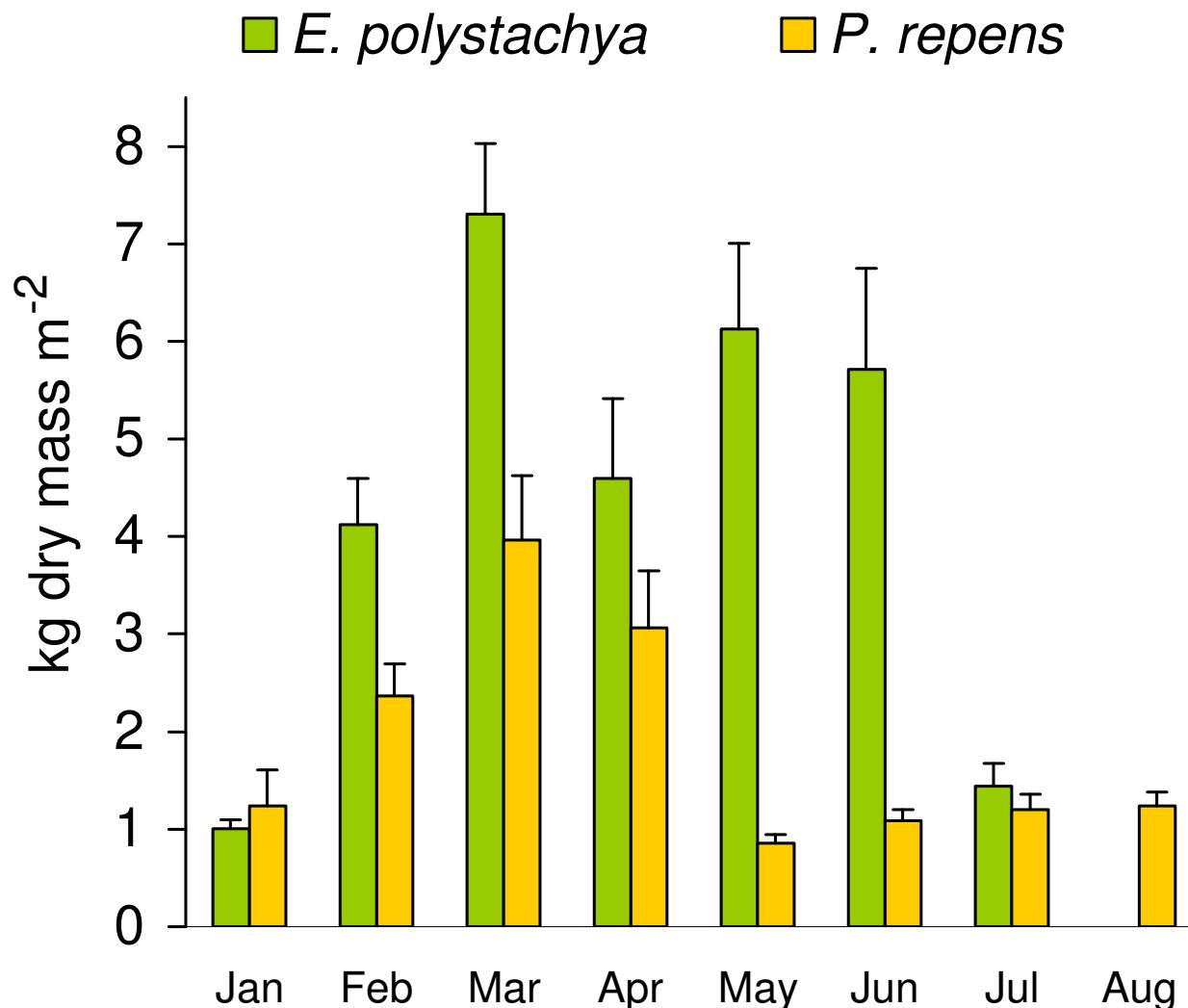


An aerial photograph showing a large, dark blue lake with numerous small, light-colored islands or sandbars. In the foreground, a wide river flows through a green, flooded forest area. The sky is overcast with white clouds.

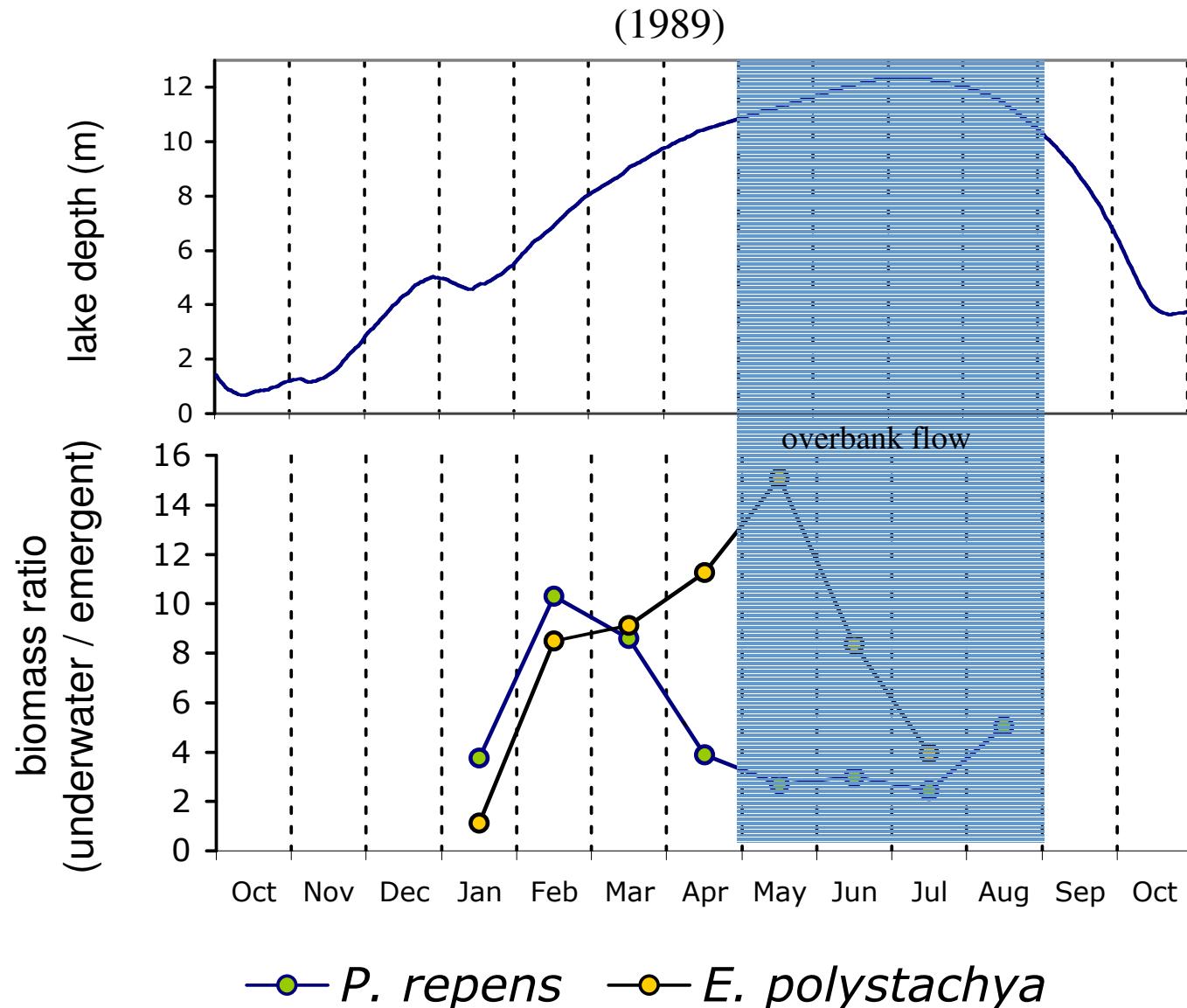
## Lake Calado – Carbon Inputs C(%)

Runoff, seepage & rainfall	4
Amazon River	4
Flooded forest litterfall	8
NPP by macrophytes	64
NPP by algae	20

# Biomass per unit area (submerged + emergent)



# Biomass ratio (underwater/emergent) vs lake depth



# Monthly loss rates for aquatic grasses in L. Calado

Mean 49%

	Areal extent of grasses (km <sup>2</sup> )	Lakewide Biomass		Percent lost
		Observed	Predicted	
March	0.329	1817	3120	42%
April	0.340	1324	2246	41%
May	0.425	996	2169	54%
June	0.496	1156	1668	31%
July	0.366	479	1869	74%
August	0.396	560	1180	53%



## Lake Calado – Carbon Losses

C(%)

Outflow	18
Burial	5
Methane evasion	2
Carbon dioxide evasion	75

# **Major inputs and outputs of organic carbon: Lake Calado**

**NPP of floating macrophyte and algae**

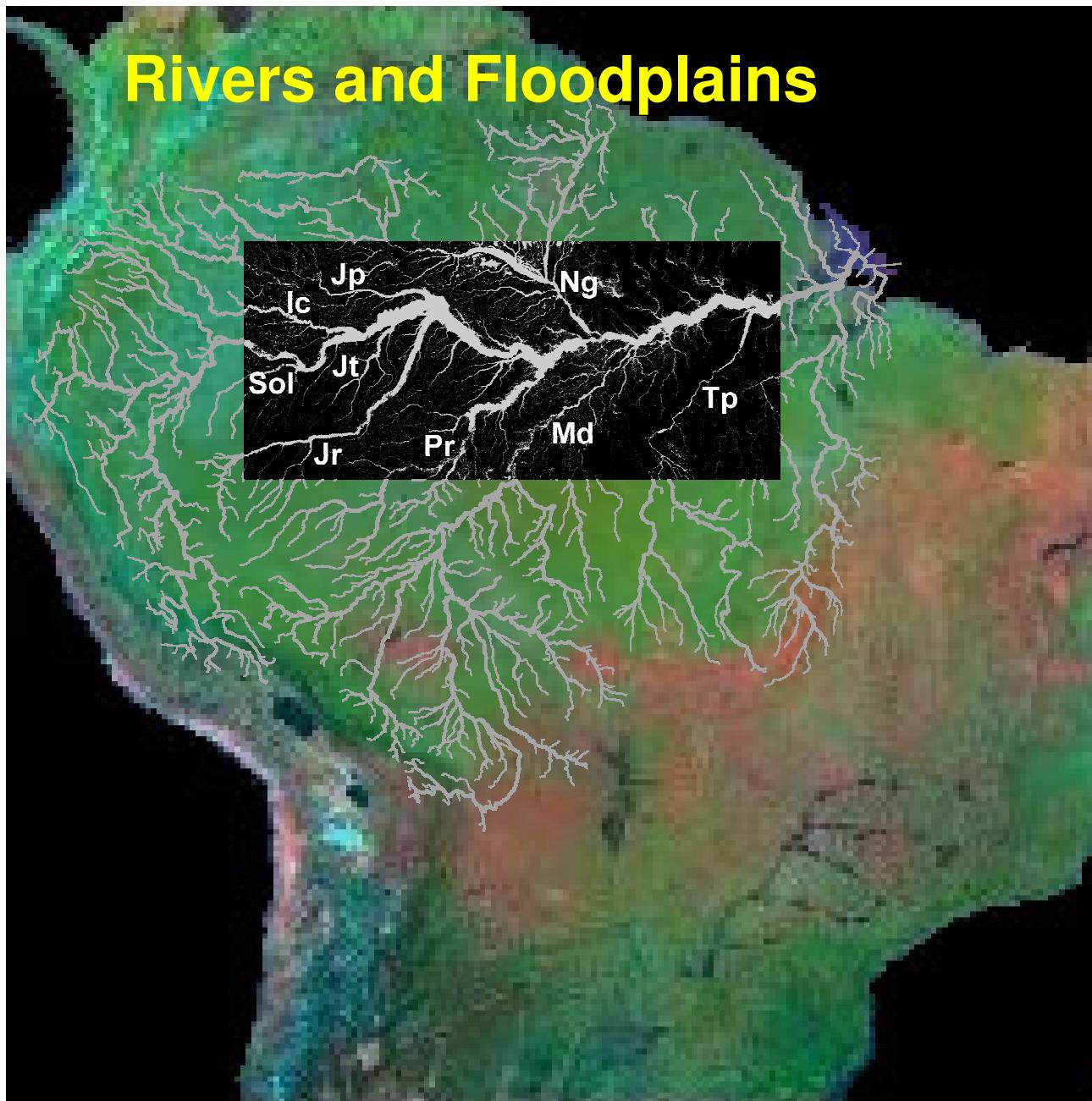
**Carbon dioxide evasion**

**Net output to river**



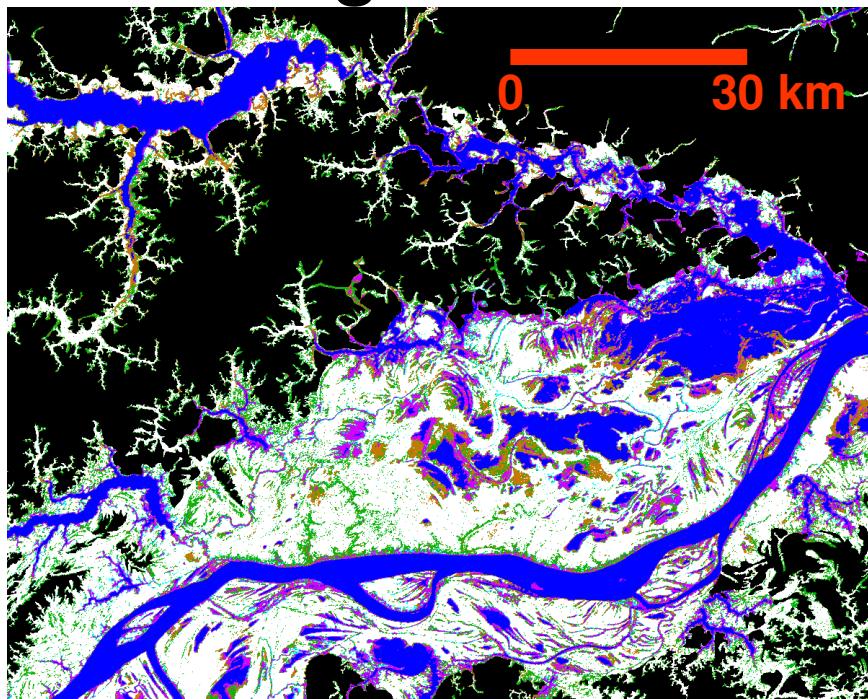
**What are regional fluxes of carbon associated with floodplains?**

# Rivers and Floodplains

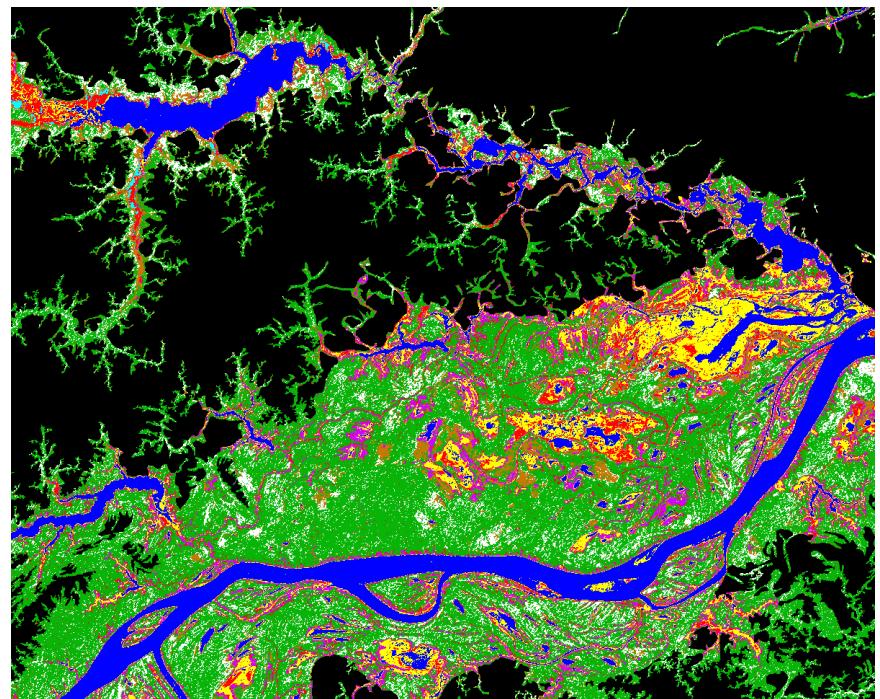


# Cabaliana Floodplain (from JERS)

High Water



Low Water



Water



Bare/herbaceous, non-flooded



Herbaceous, flooded



Shrub, non-flooded



Shrub, flooded



Woodland, flooded



Forest, non-flooded



Forest, flooded



**River channels and floodplains**

(> 100 m wide):

79,000 to 290,000 km<sup>2</sup>

**Streams and small rivers**

(< 100 m wide):

21,000 to 51,000 km<sup>2</sup>

**Amazon-basin river and floodplain waters  
are highly supersaturated in dissolved CO<sub>2</sub>**

# Central Amazon Basin (1.77 million km<sup>2</sup>)

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Methane Emission  
Tg C y<sup>-1</sup>

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**$6.8 \pm 1.3$**

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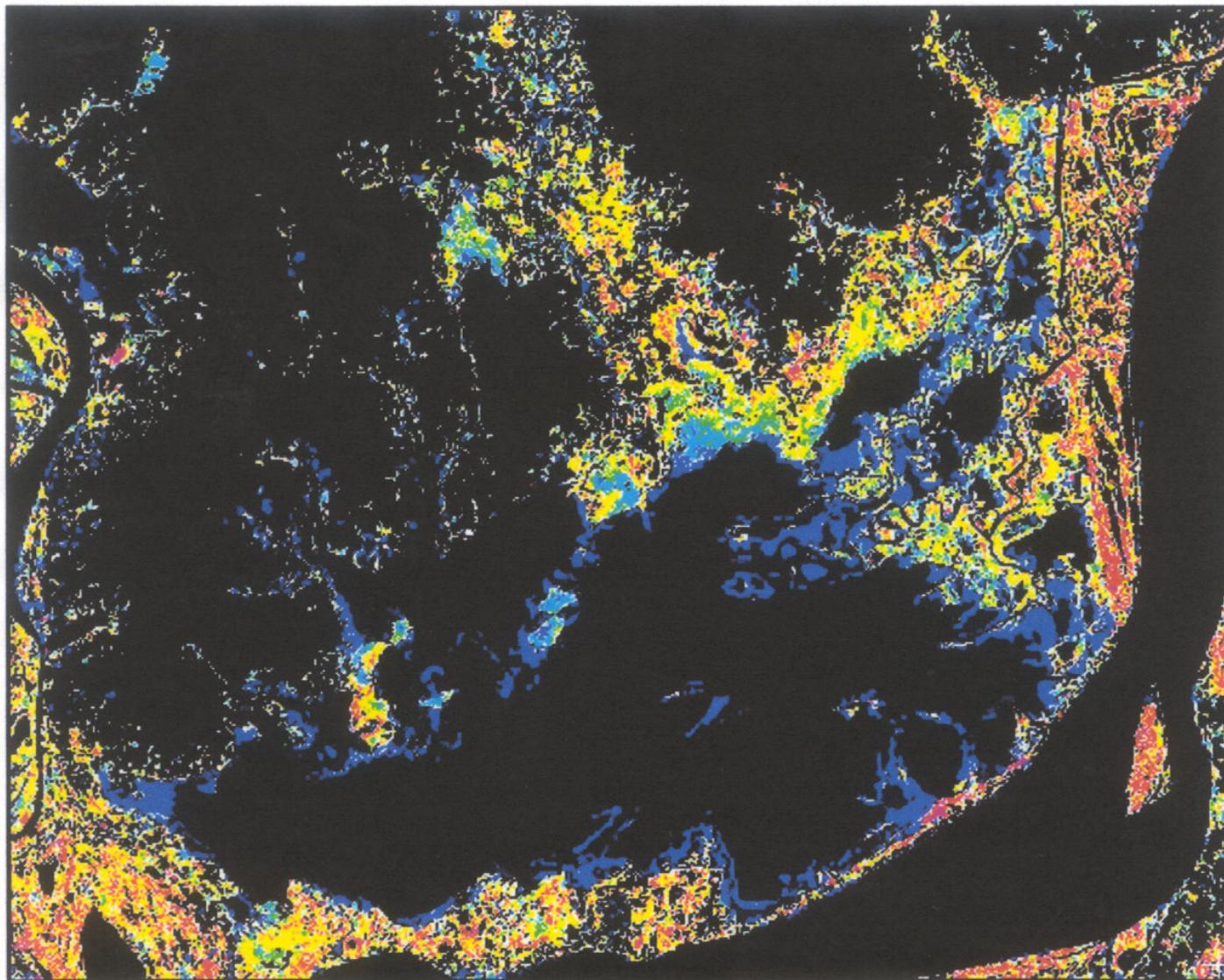
CO<sub>2</sub> Evasion  
Tg C y<sup>-1</sup>

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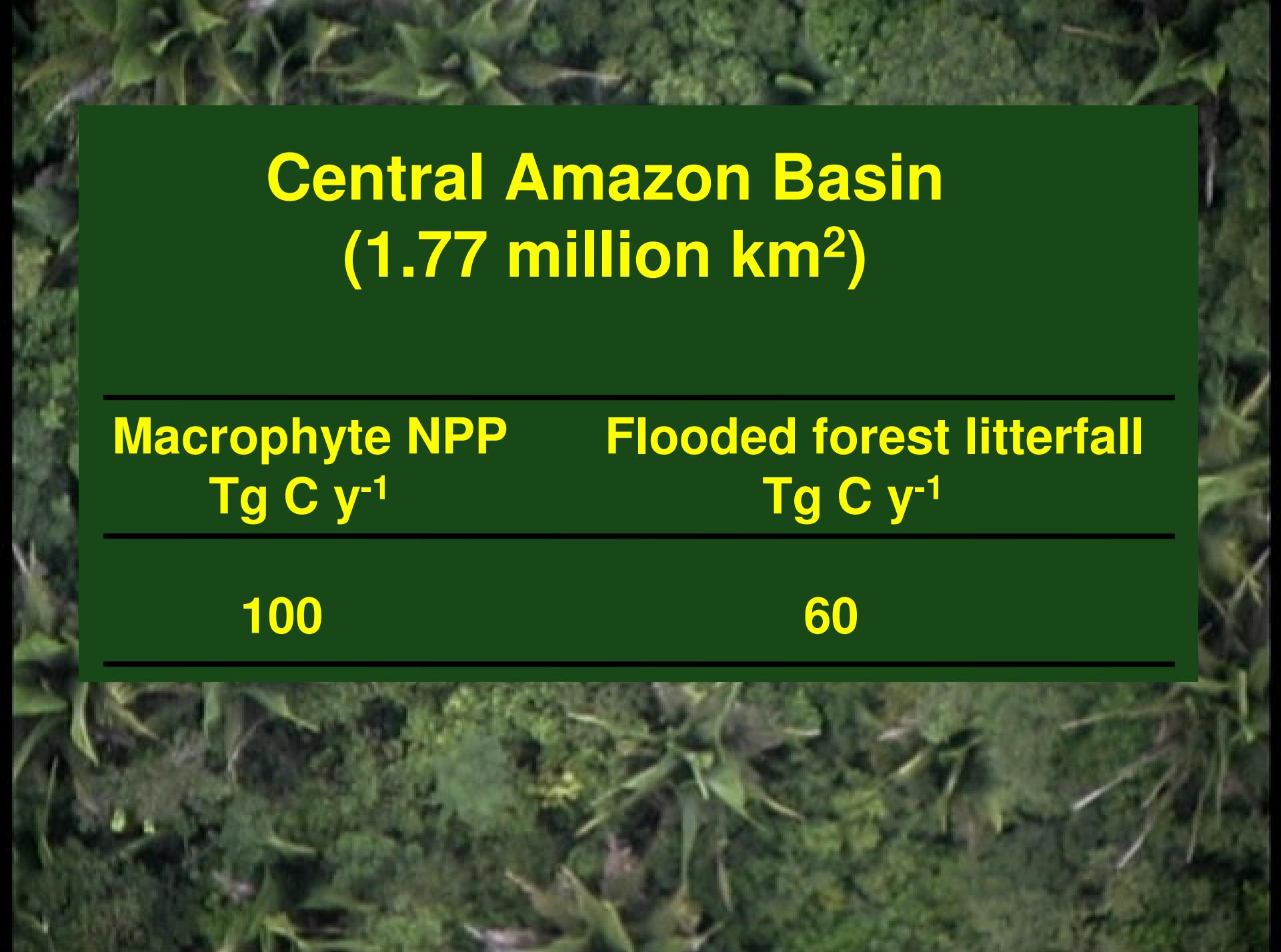
**$210 \pm 60$**

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# Net Annual Primary Productivity of Floating Macrophytes



M. Costa 2000, 2005



# **Central Amazon Basin**

**(1.77 million km<sup>2</sup>)**

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**Macrophyte NPP**  
**Tg C y<sup>-1</sup>**

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**100**

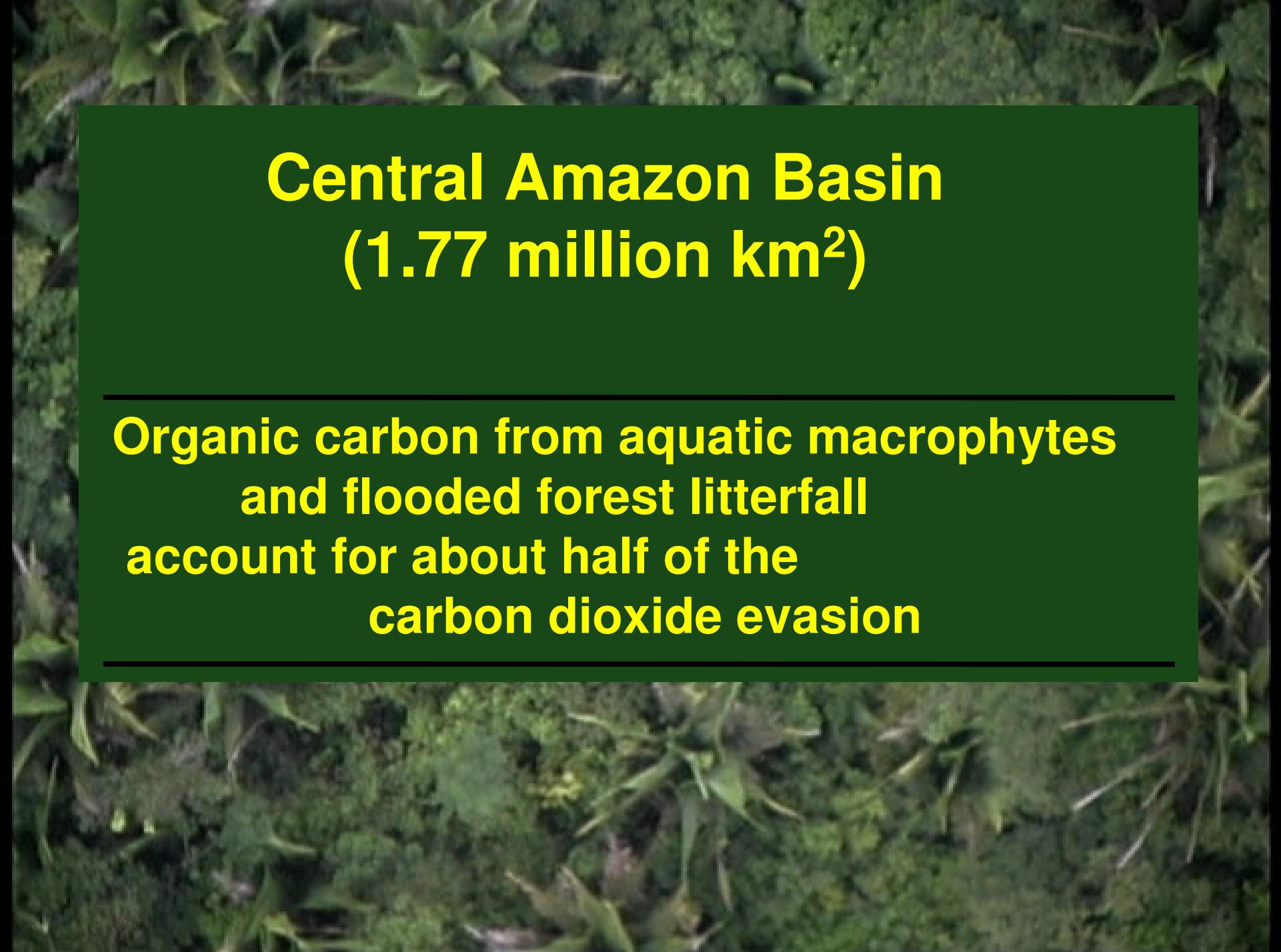
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**Flooded forest litterfall**  
**Tg C y<sup>-1</sup>**

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**60**

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# **Central Amazon Basin (1.77 million km<sup>2</sup>)**

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**Organic carbon from aquatic macrophytes  
and flooded forest litterfall  
account for about half of the  
carbon dioxide evasion**

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