

Overcoming Information Limitations for Prescription of an Environmental Flow Regime for Rio Patuca, Honduras

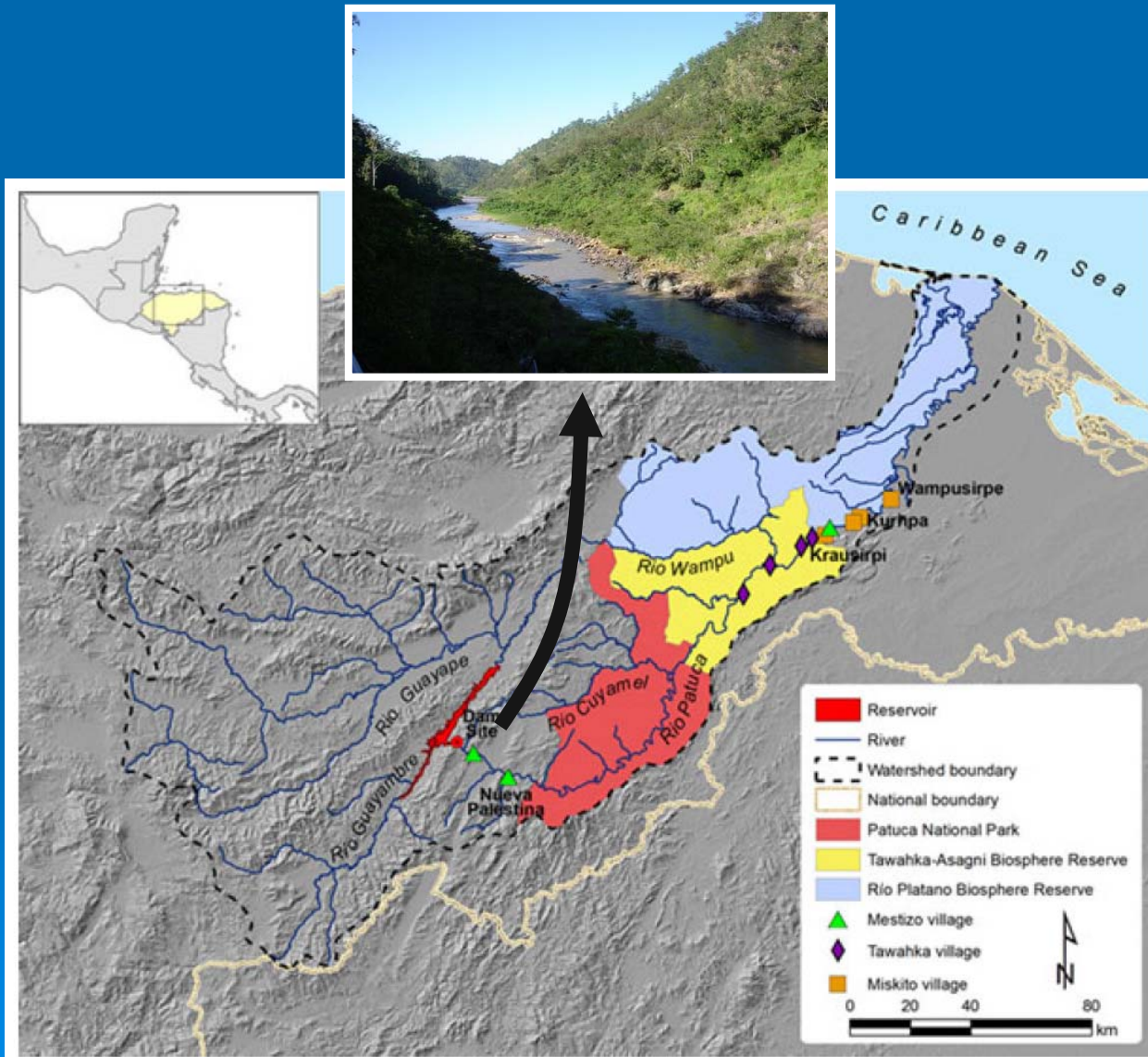
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² The Nature Conservancy

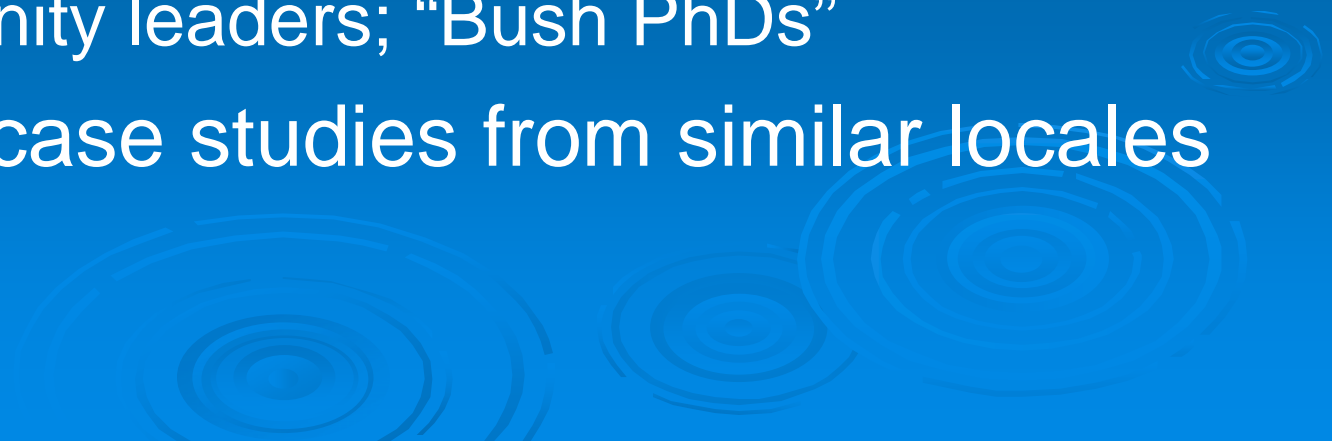


Patuca River and Patuca 3

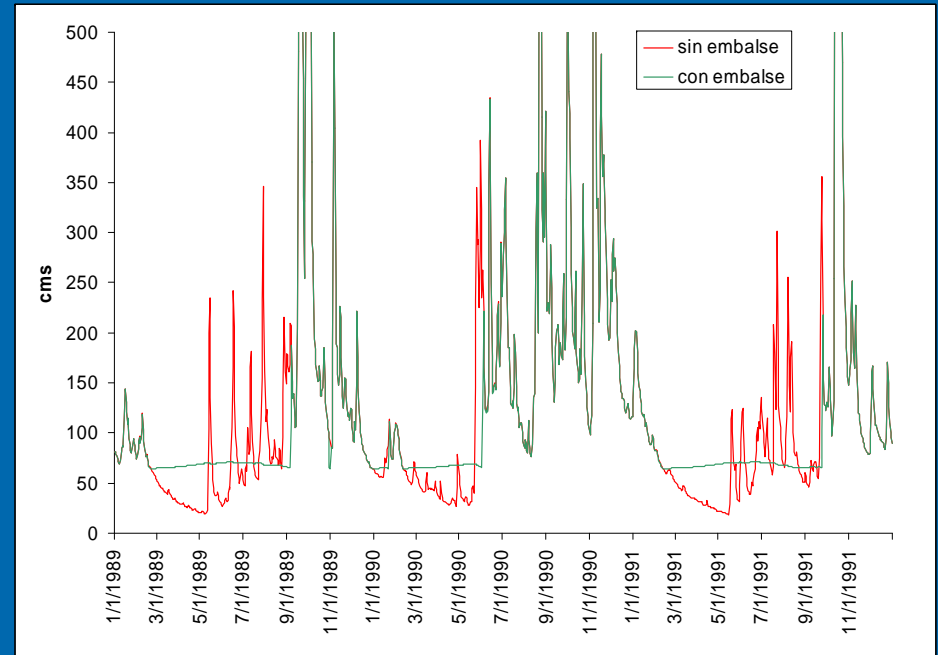
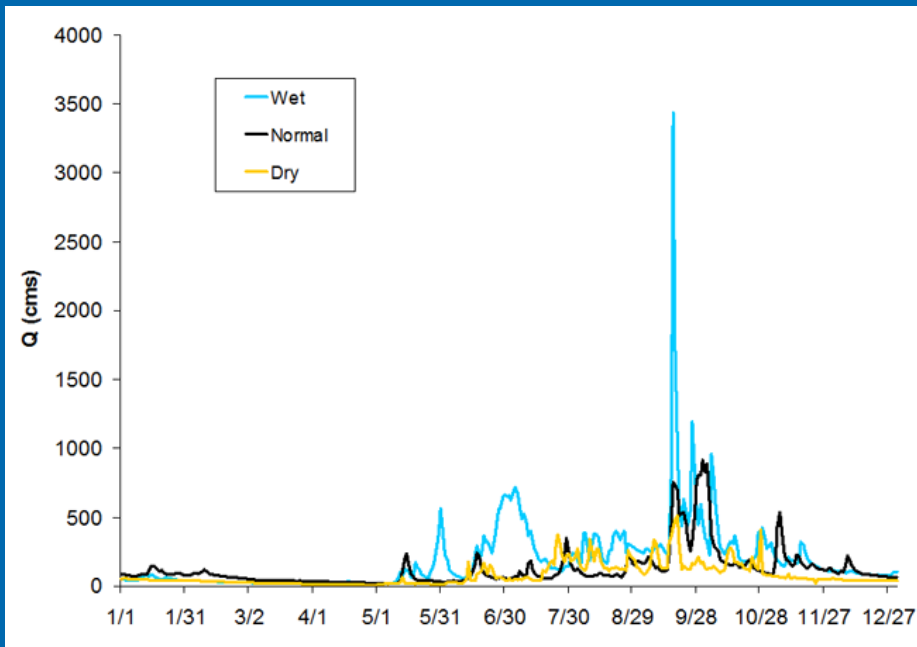


Patuca 3:
Capacity = 104 MW
Height = 54 m
Width = 208 m
Reservoir = 1.2 km³

How to develop ecological flow recommendations in the absence of scientific data?

1. Use available data to greatest extent
 2. Field reconnaissance and interviews of community members
 3. Assemble experts in workshops
 - Scientists, consultants, technicians
 - Community leaders; “Bush PhDs”
 4. Draw on case studies from similar locales
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Indicators of Hydrologic Alteration



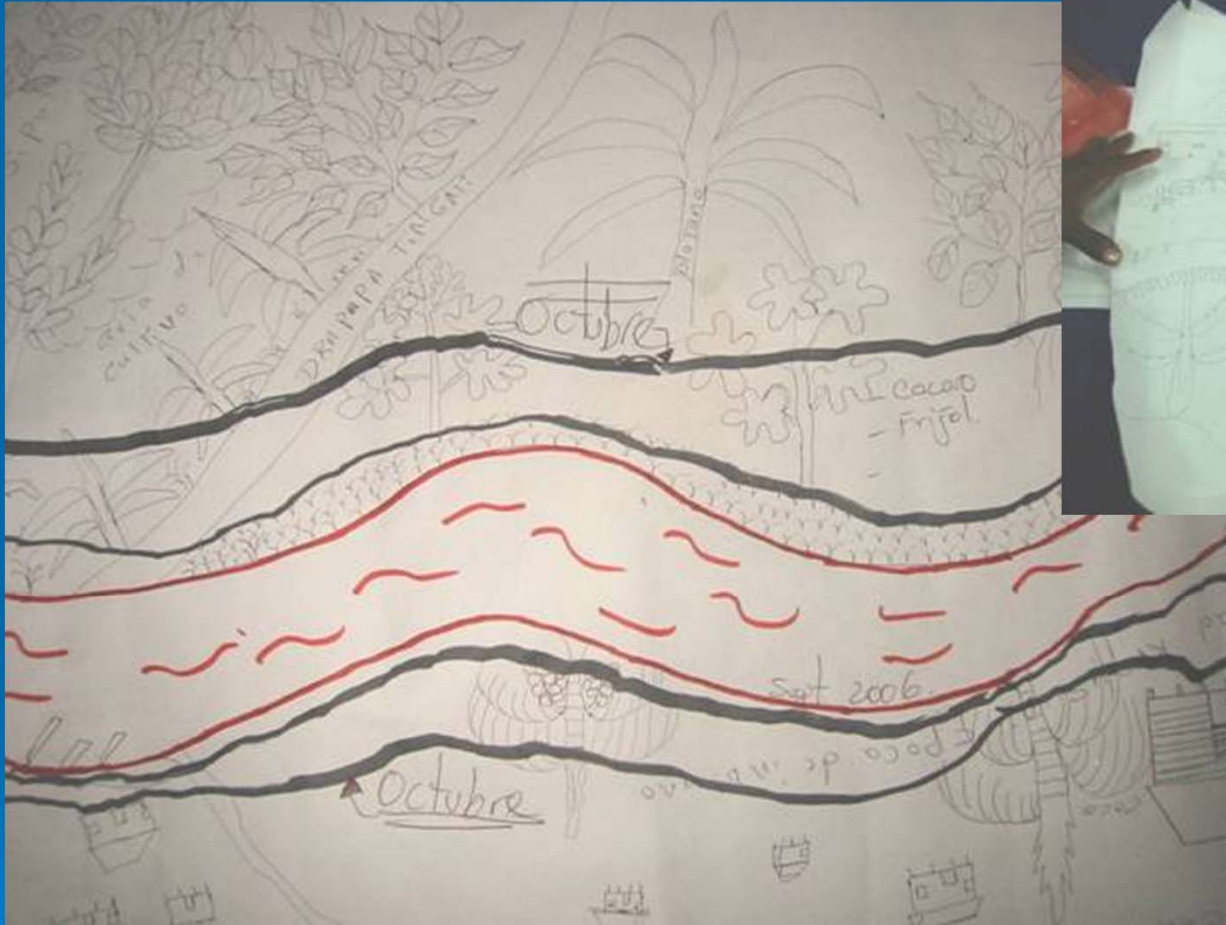
- 3 hydrologic year-types (dry, normal, wet)
- Elevated low flows during dry season
- Decline of high-flow pulses

Surveyed communities about valued species and flow attributes

- Assembled a provisional species list and details of their life histories
- Identified transportation needs/challenges
- Importance of flooding to use of space



Techniques for discussion of flow levels



Depicted
seasonal flow
levels relative to
crops and villages
spaces on maps

Techniques for discussion of flow levels



Annotating photos for river stage in workshops

Pimienta (20 May 07)

Highest level for fish. Cleans the channel. Duration 1 week (July and Oct. 2006)

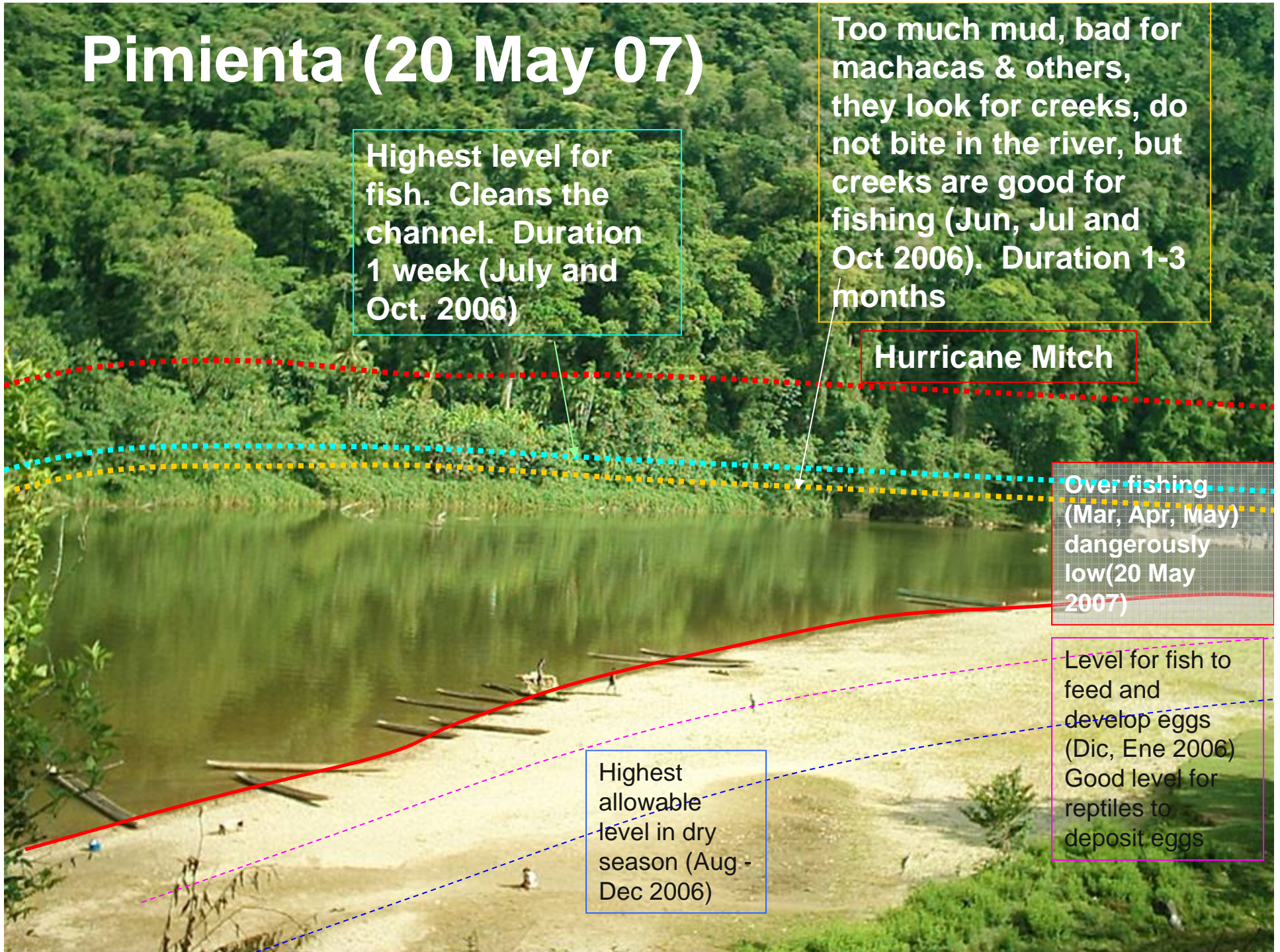
Too much mud, bad for machacas & others, they look for creeks, do not bite in the river, but creeks are good for fishing (Jun, Jul and Oct 2006). Duration 1-3 months

Hurricane Mitch

Over fishing (Mar, Apr, May) dangerously low (20 May 2007)

Level for fish to feed and develop eggs (Dic, Ene 2006)
Good level for reptiles to deposit eggs

Highest allowable level in dry season (Aug - Dec 2006)



Techniques for discussion of flow levels



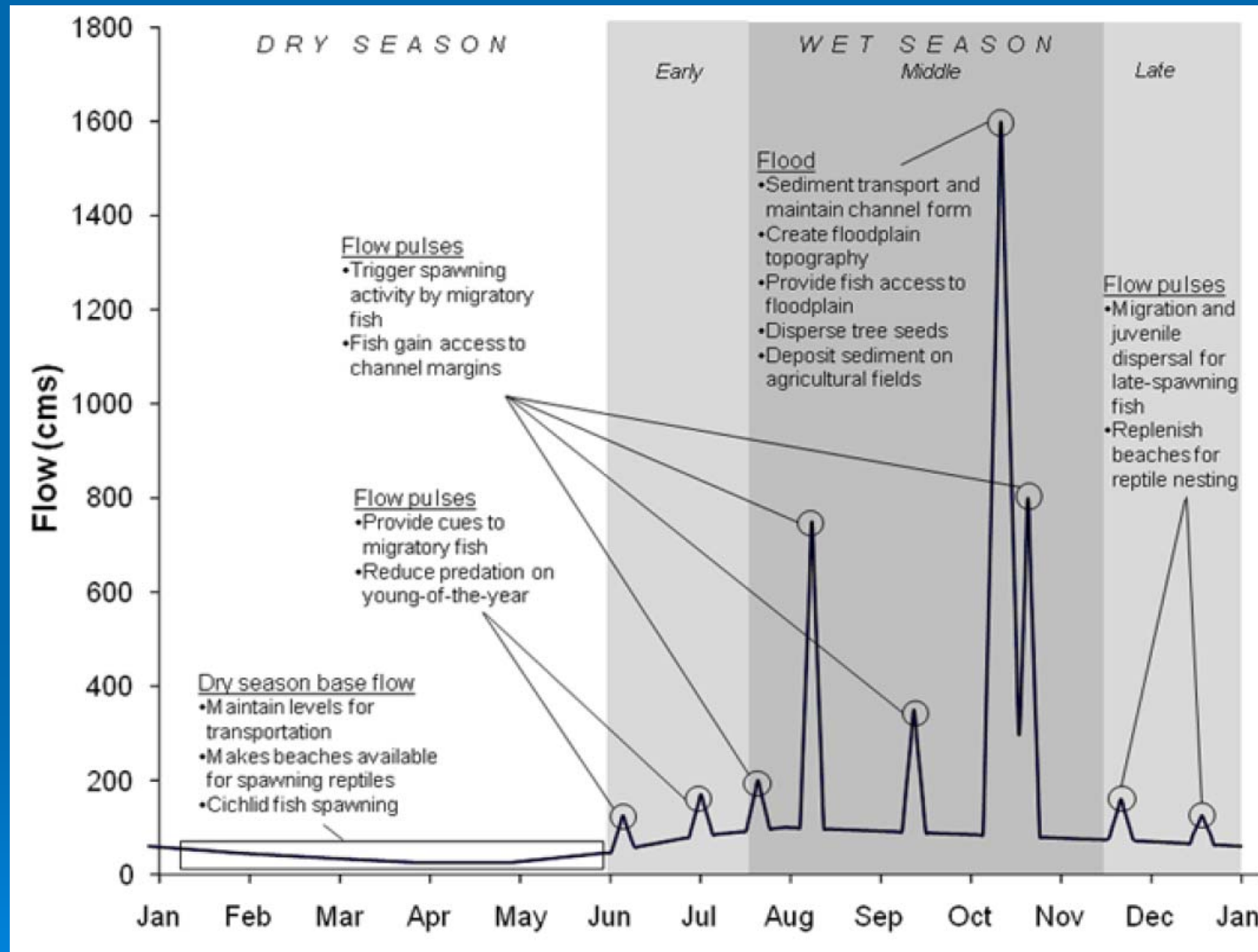
Identified sites on river and flow levels that hinder boat traffic and trade



Main Findings

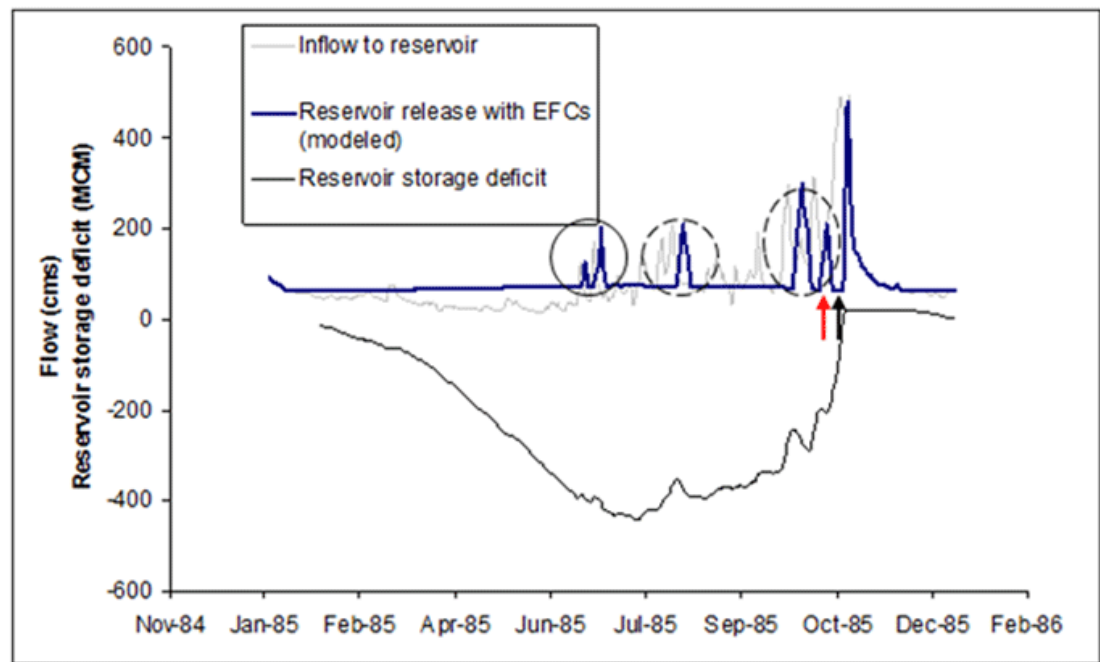
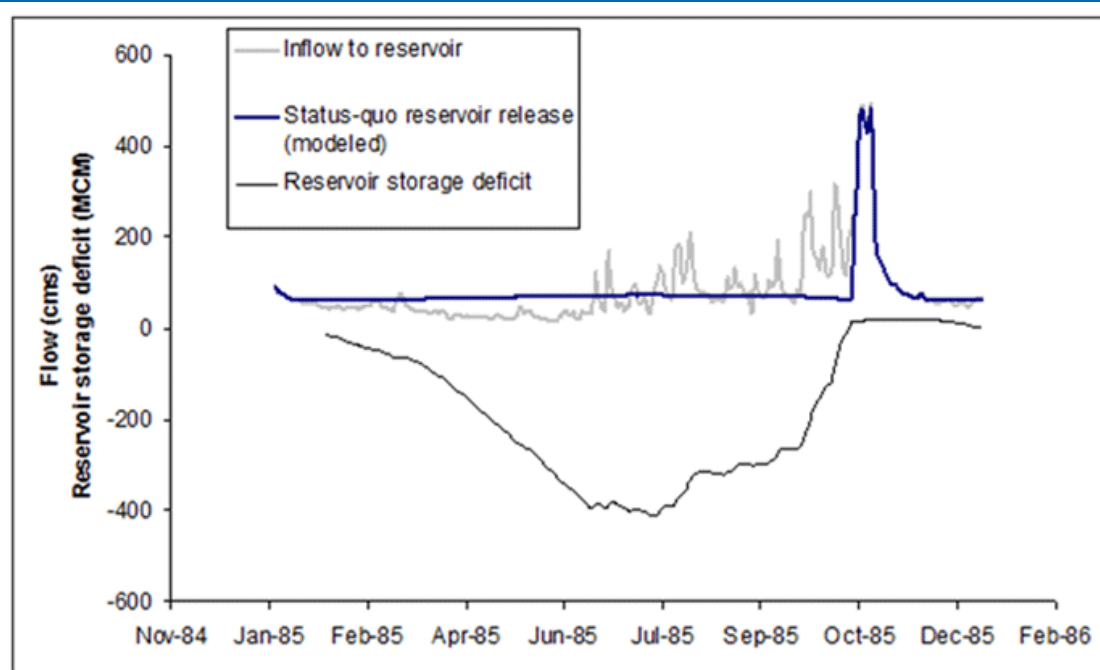
- Reservoir will attenuate early flow pulses and elevate dry season base flow
- 43 aquatic species used for food
- 14 valued species are migratory
- Floods generally seen as beneficial for crop fertilization, aquatic species, and riparian plant diversity
- Transportation hindered by low flows; but dangerous in places during floods

Recommended Flow Regime



Esselman, P.C., and J.J. Opperman. 2010. Overcoming information limitations for the prescription of an environmental flow regime for a Central American river. *Ecology and Society* 15 (1): 6.

Simple reservoir
mass balance
model suggests
that release of
early wet season
pulses will delay
reservoir filling by
only ~8 days



Limitations of site-level planning

Can potentially address:

- Seasonal patterns of flow and flow events
- Impacts from peaking operations

Much more difficult to address:

- Migratory fish and longitudinal connectivity
- Sediment delivery
- Temperature and water quality
- Mercury accumulation in food web
- Loss of free-flowing river, estuary effects, etc.

A larger vision...

- ~320 dam sites identified in Central America
- An integrated landscape perspective on dam siting is necessary to achieve 'sustainable hydropower'
- Key components:
 - Large-scale planning that accounts for multiple values and benefits
 - Multiple configurations for any energy target
 - Apply mitigation hierarchy



Acknowledgements

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- Indigenous communities of the Patuca