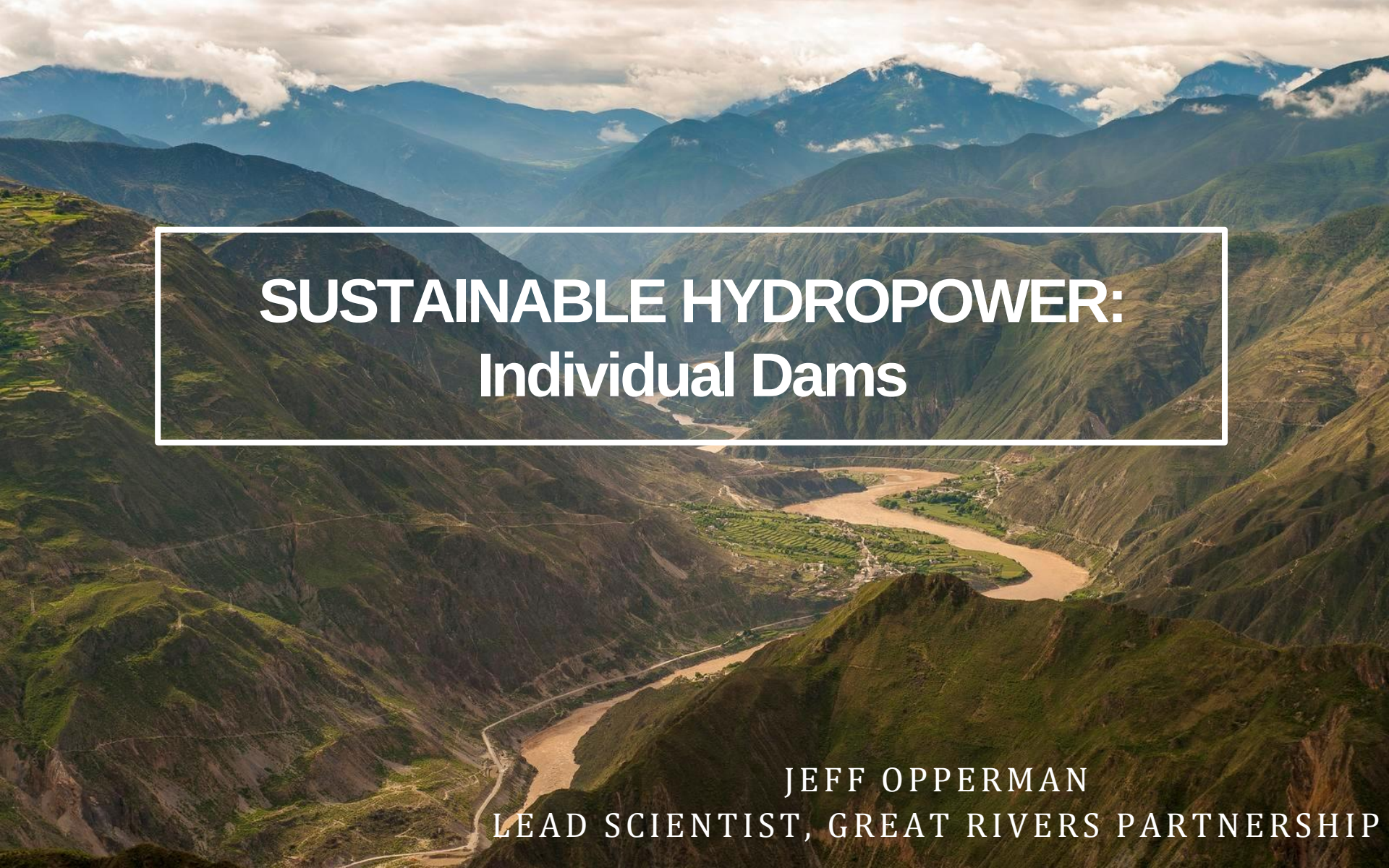
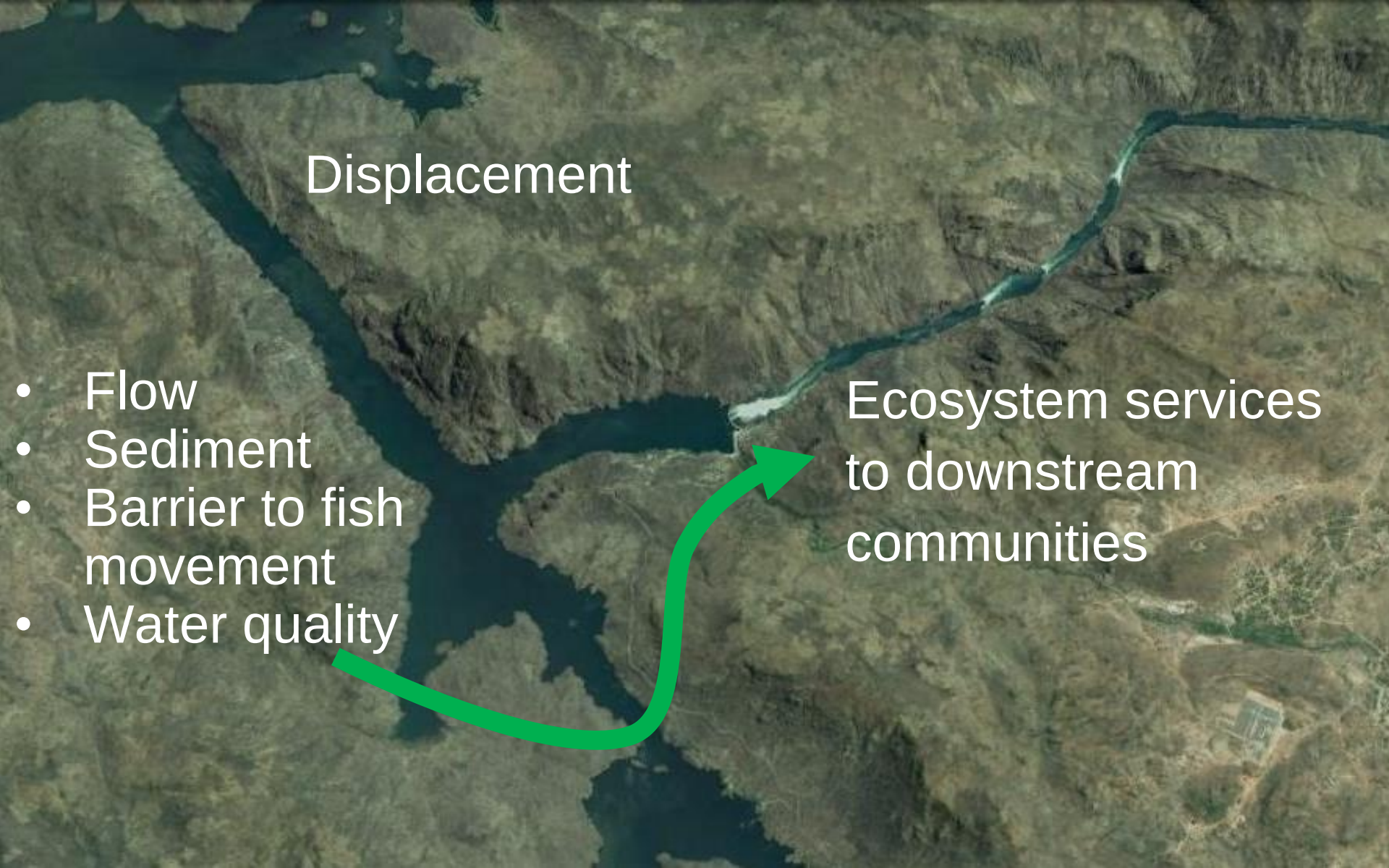
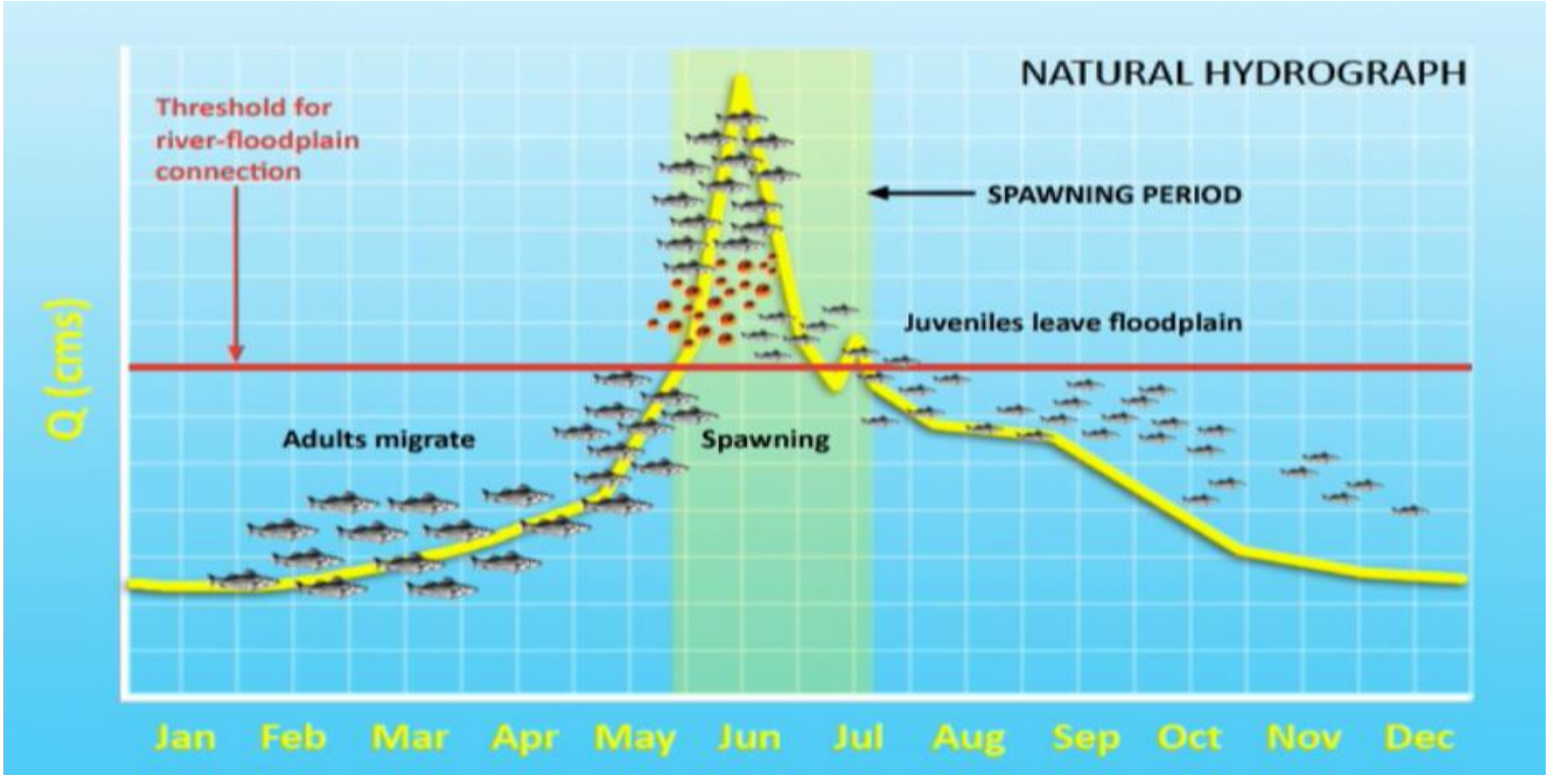


SUSTAINABLE HYDROPOWER:
Individual Dams

JEFF OPPERMAN
LEAD SCIENTIST, GREAT RIVERS PARTNERSHIP


Displacement
• Flow
• Sediment
• Barrier to fish movement
• Water quality
Ecosystem services to downstream communities


NATURAL HYDROGRAPH
Threshold for river-floodplain connection
SPAWNING PERIOD
Juveniles leave floodplain
Adults migrate
Spawning
Q (cms)
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec

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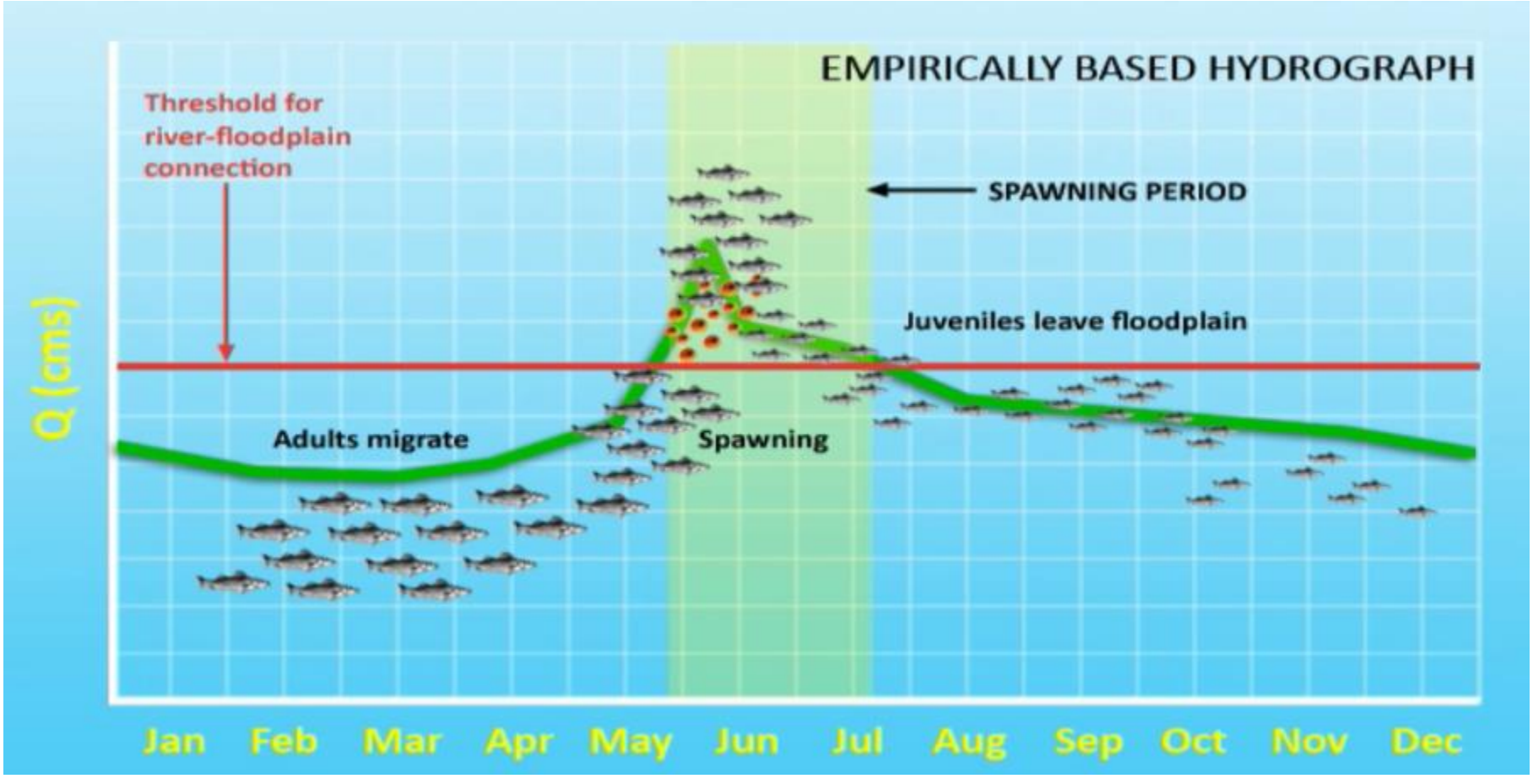
EMPIRICALLY BASED HYDROGRAPH
Threshold for river-floodplain connection
SPAWNING PERIOD
Juveniles leave floodplain
Adults migrate
Spawning
Q (cms)
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec

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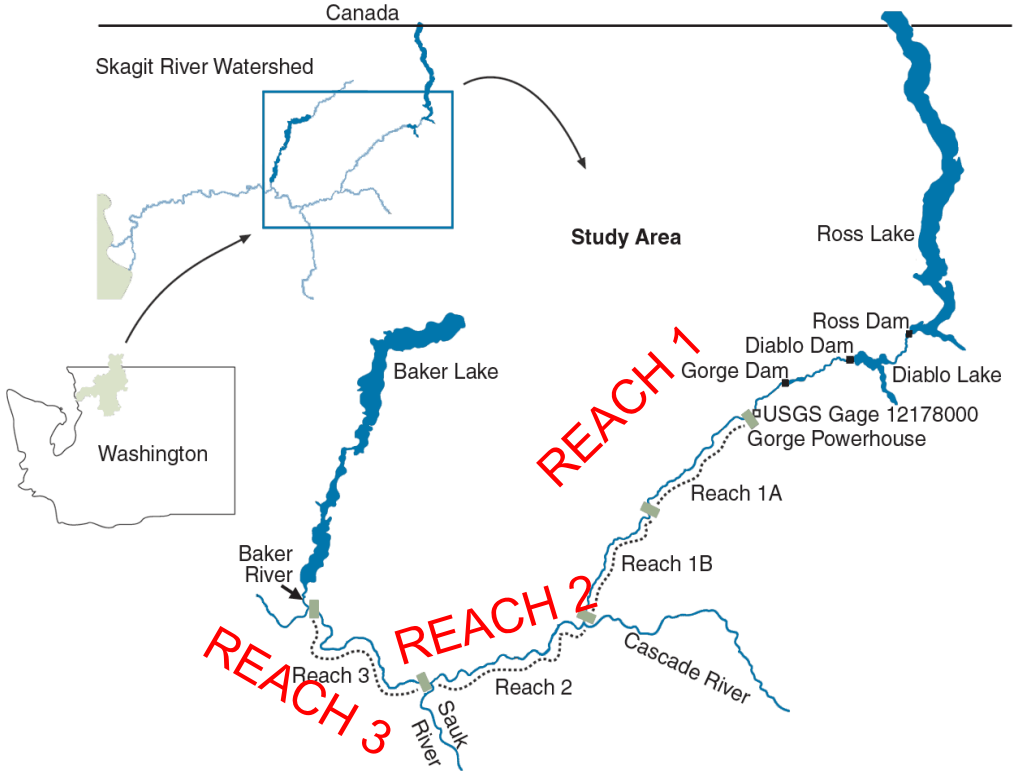
US Army Corps of Engineers®

Alamo Dam

Bill Williams River (Arizona)



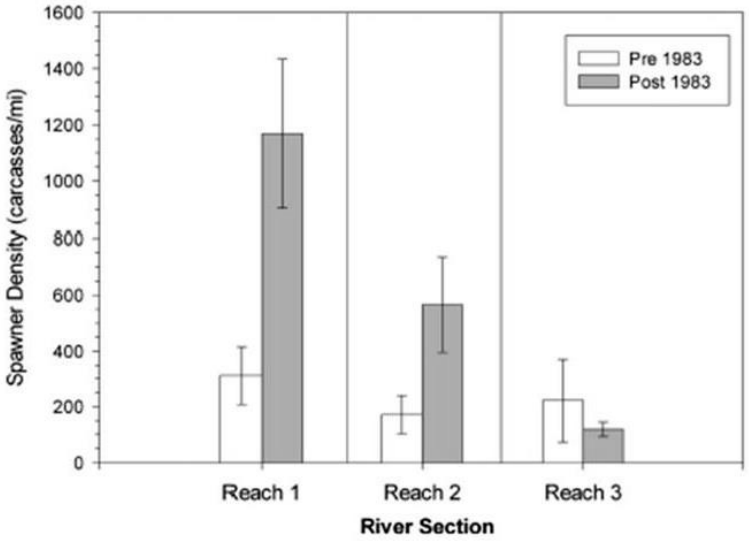
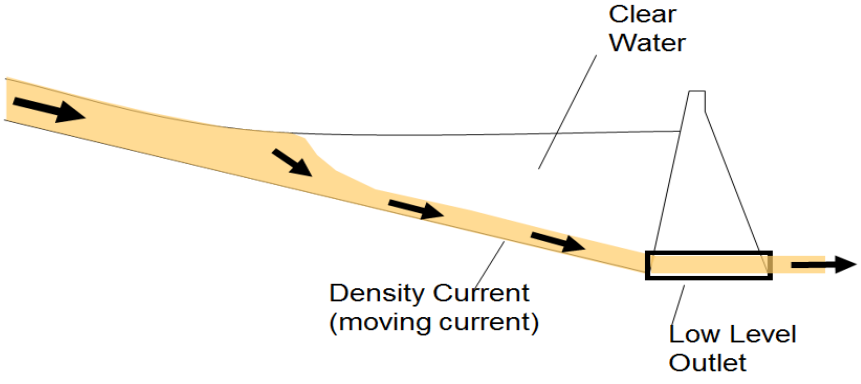
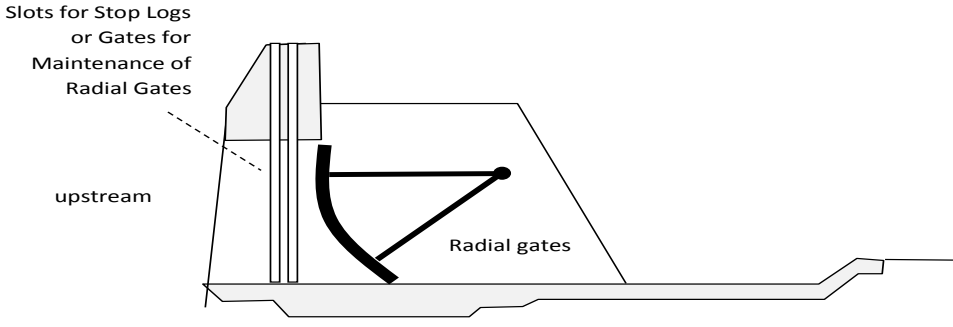


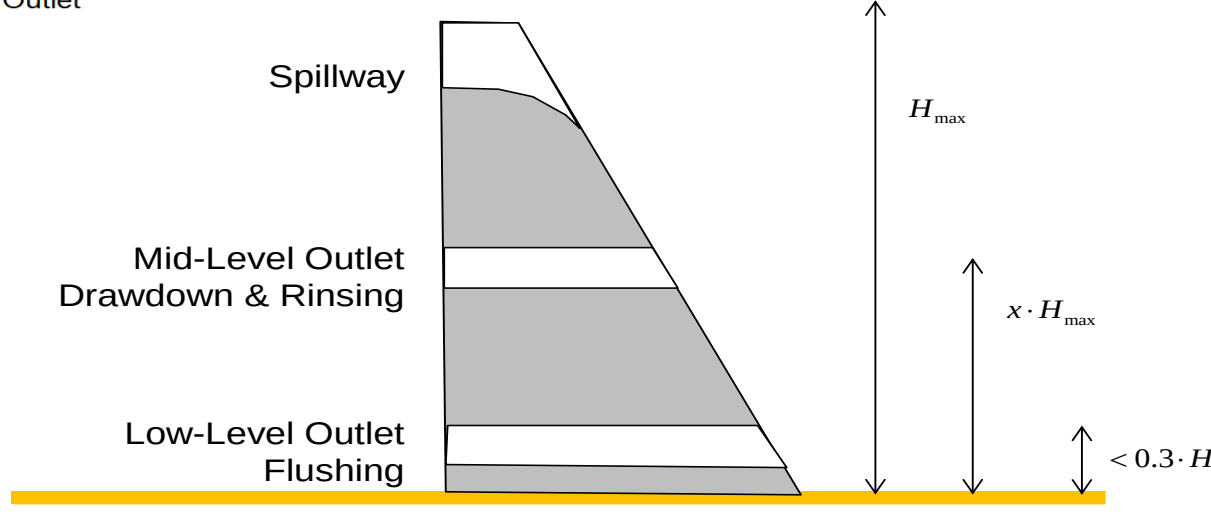
FIGURE 5.—Mean density of pink salmon spawner carcasses (±SE) in odd-numbered years during 1959–1981 (pre-1983) and 1983–2001 (post-1983) within three reaches of the upper Skagit River, Washington, downstream of the Skagit Hydroelectric Project.

Connor, E. J. and Pflug, D. E. (2004). Changes in the distribution and density of pink, chum, and chinook salmon spawning in the upper Skagit River in response to flow management measures. *North American Journal of Fisheries Management*.

Designs for sediment management

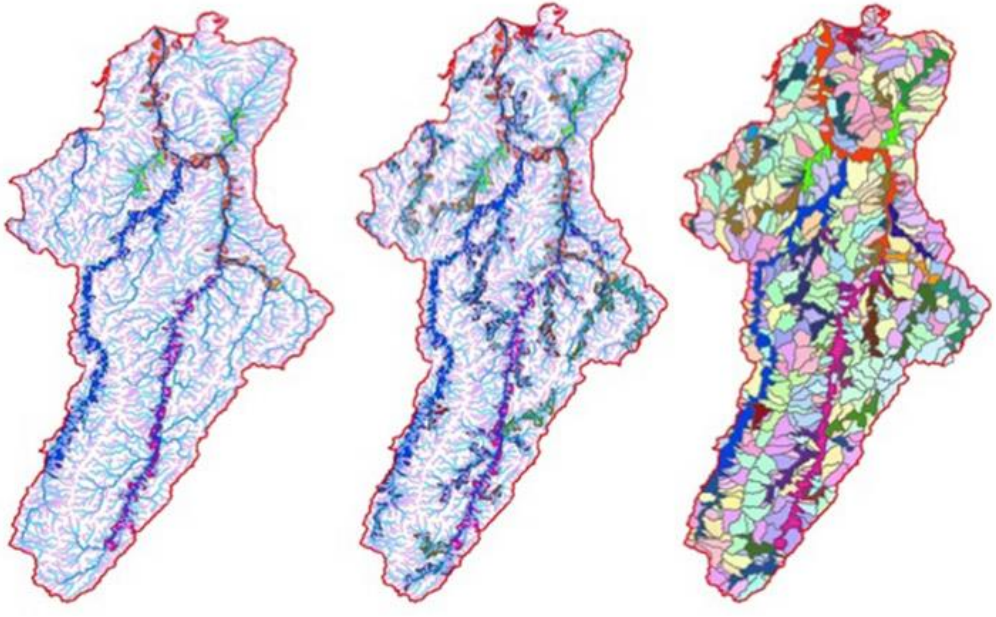


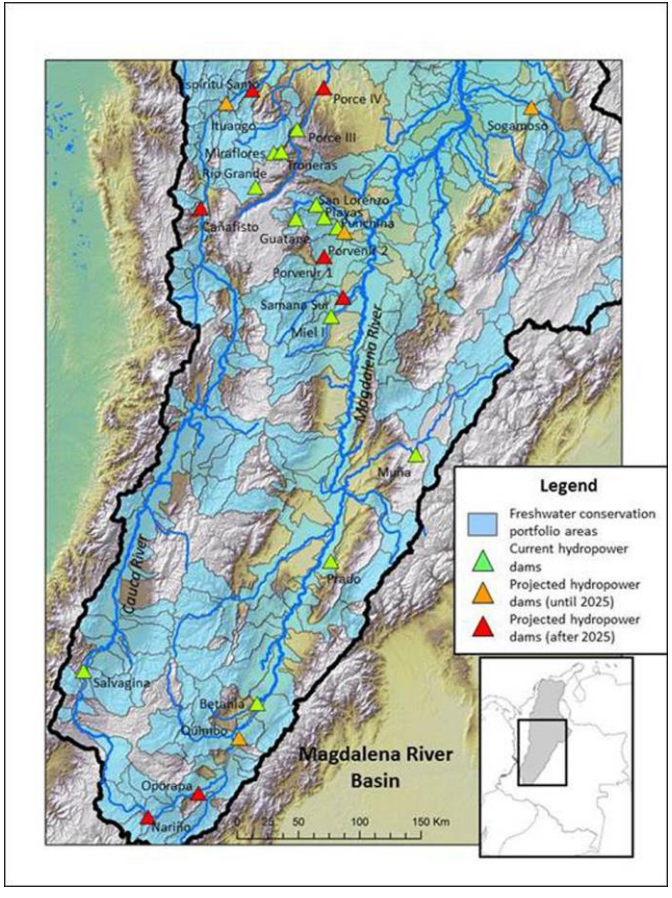




Project licensing using mitigation hierarchy and compensation based on basin “blueprint”

Magdalena Basin tributaries and headwater ecological systems





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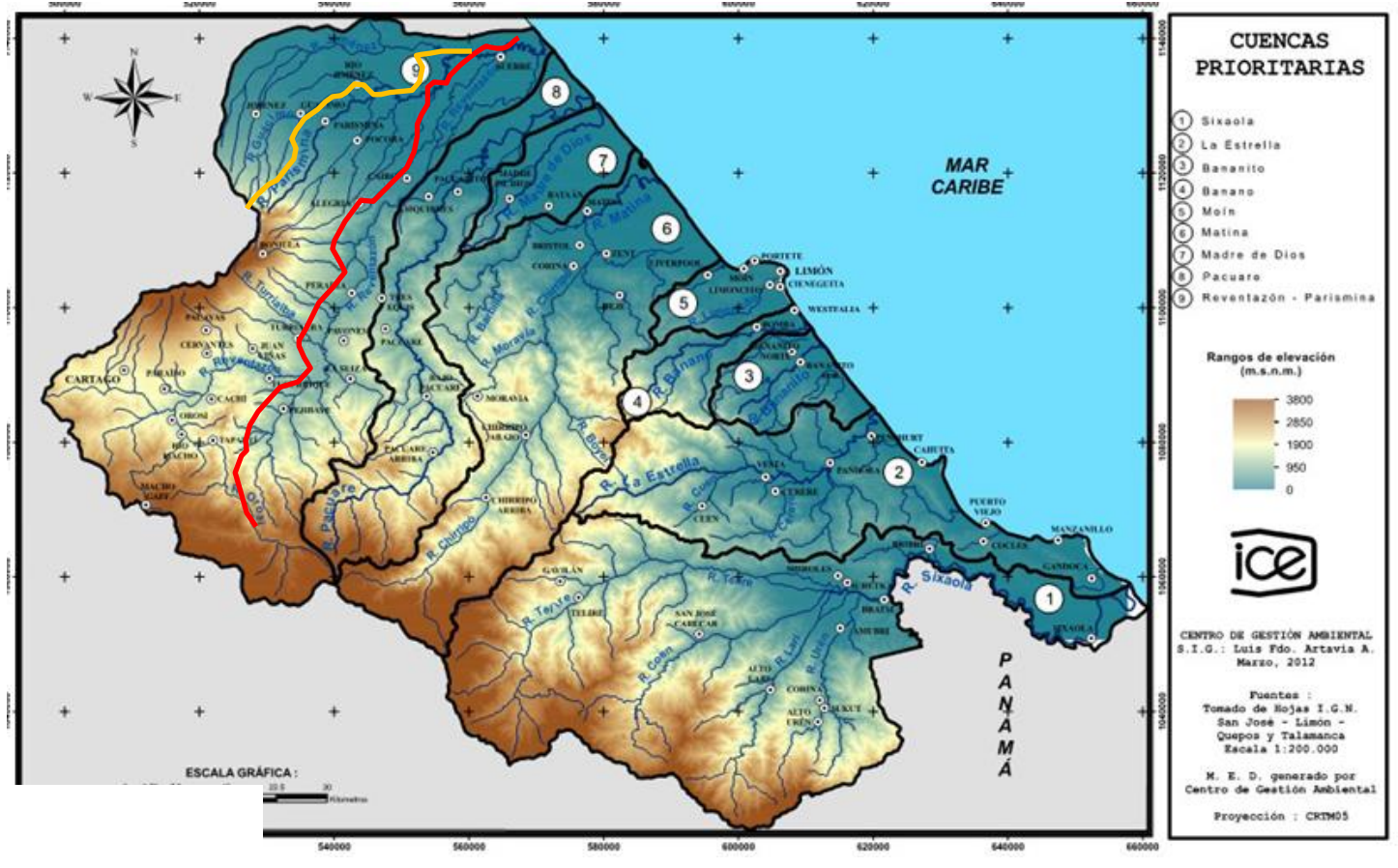
Mitigation through offsets in Costa Rica:

mitigating hydropower on Reventazon by protecting a free-flowing river - Parisima



Hydropower Sustainability Assessment Forum

- China Institute of Water Resources and Hydropower Research
- China Hydropower Engineering Consulting Group
- Zambia – Ministry of Energy and Water Development

- Norad (Norway)
- National Energy Authority (Iceland)
- GTZ (Germany)

- Equator Principles Financial Institutions
- The World Bank (observer)

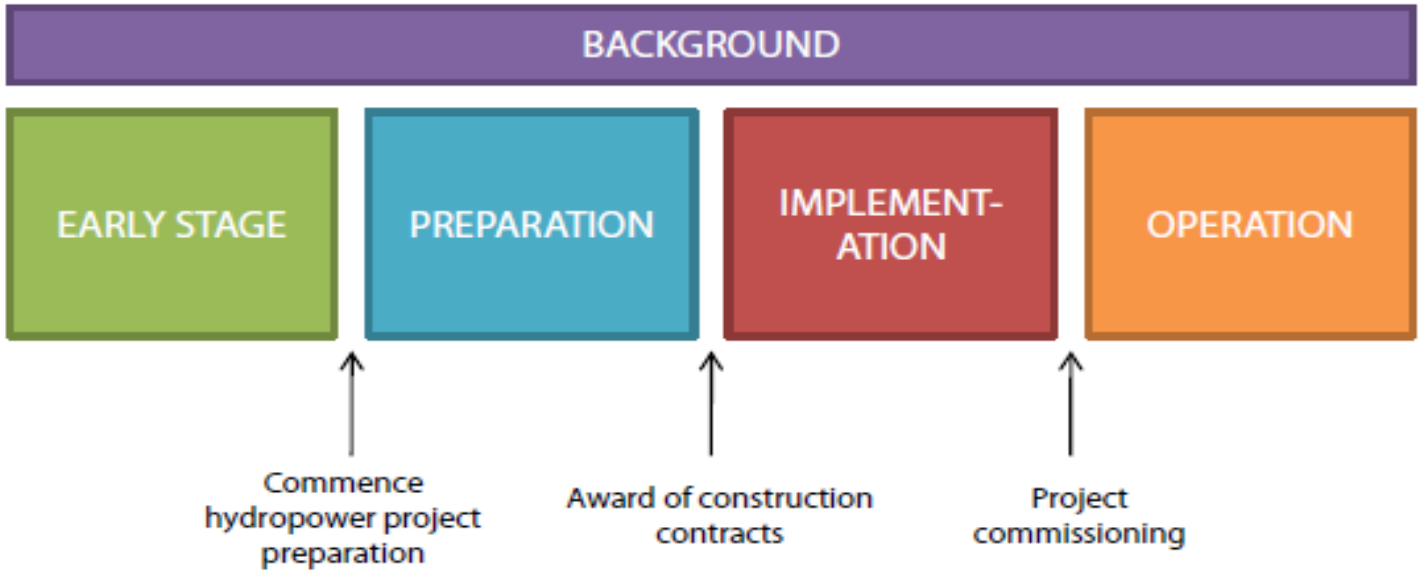
- International Hydropower Association
- Hydro Tasmania

- The Nature Conservancy
- WWF

- Oxfam
- Transparency International

Hydropower Sustainability Assessment Protocol

Protocol: four assessment tools



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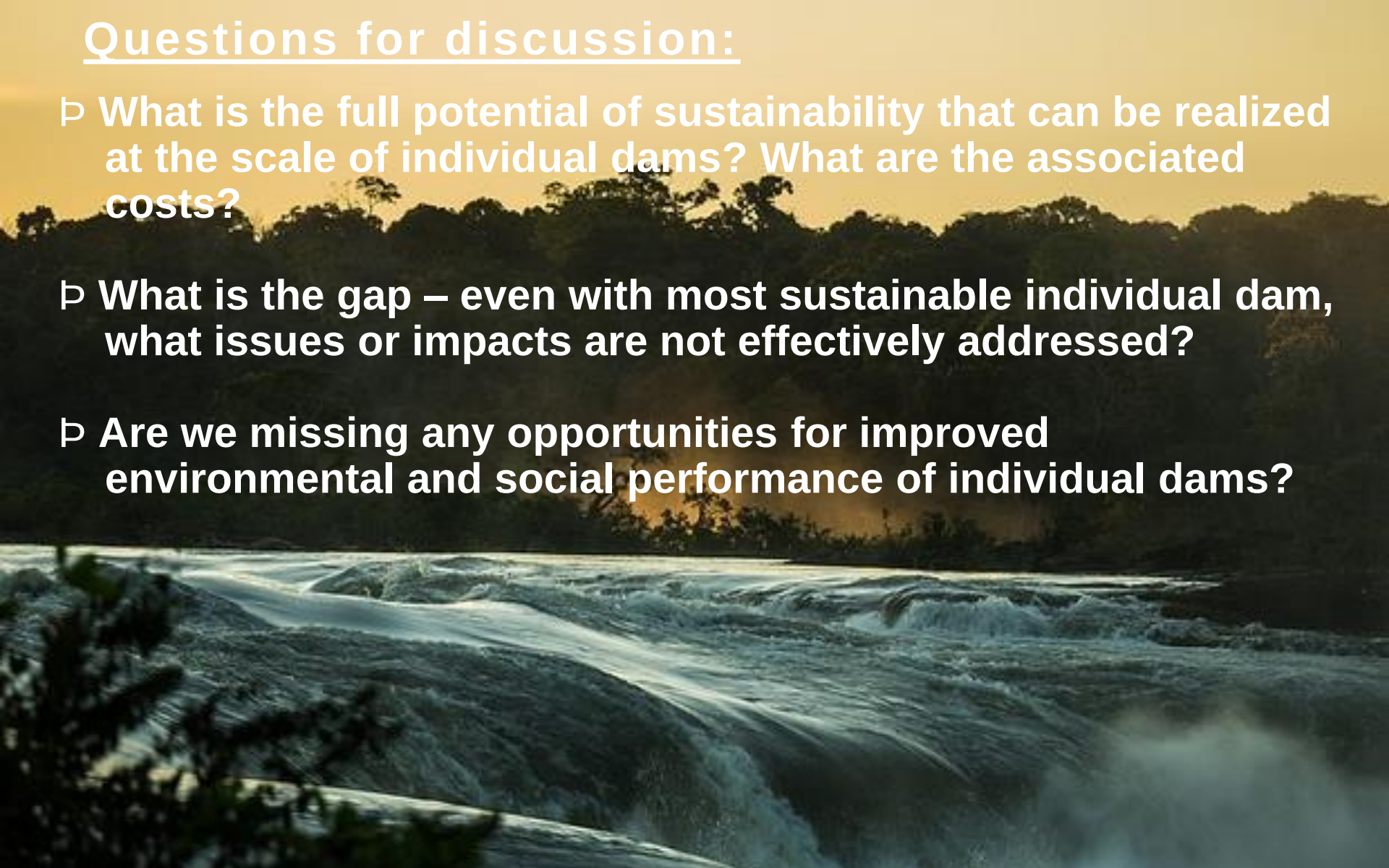

Questions for discussion:

- What is the full potential of sustainability that can be realized at the scale of individual dams? What are the associated costs?

- What is the gap – even with most sustainable individual dam, what issues or impacts are not effectively addressed?

- Are we missing any opportunities for improved environmental and social performance of individual dams?