Designing and Operating a Large Dam Cascade on the Yangtze River for Multiple Benefits

Qiaoyu Guo, David Harrison, and Tong Lu
(Presented by Eloise Kendy)

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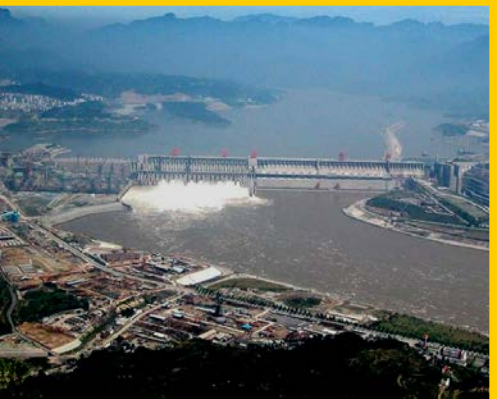

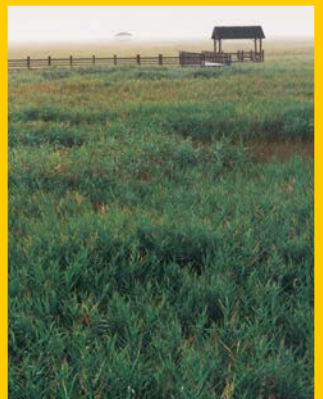

Environmental impacts of dams

- Direct habitat destruction in the inundated area
- Barriers to migration along rivers
- Downstream changes:
  - Sediment transport and deposition
  - Water temperature regime
  - Flow regime
  - Connection between river and floodplain

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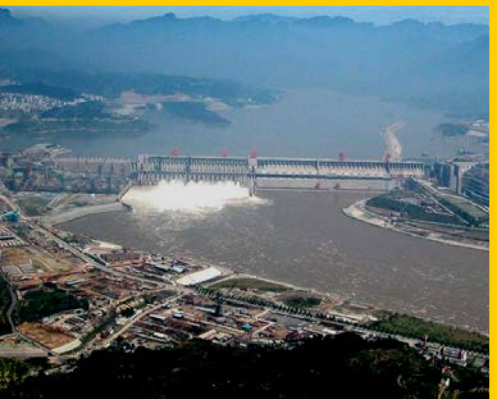
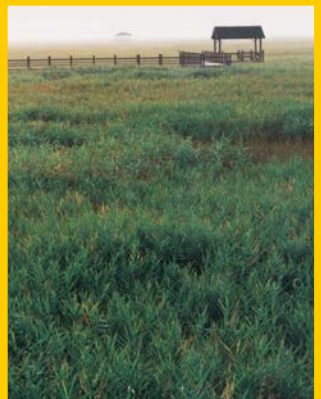
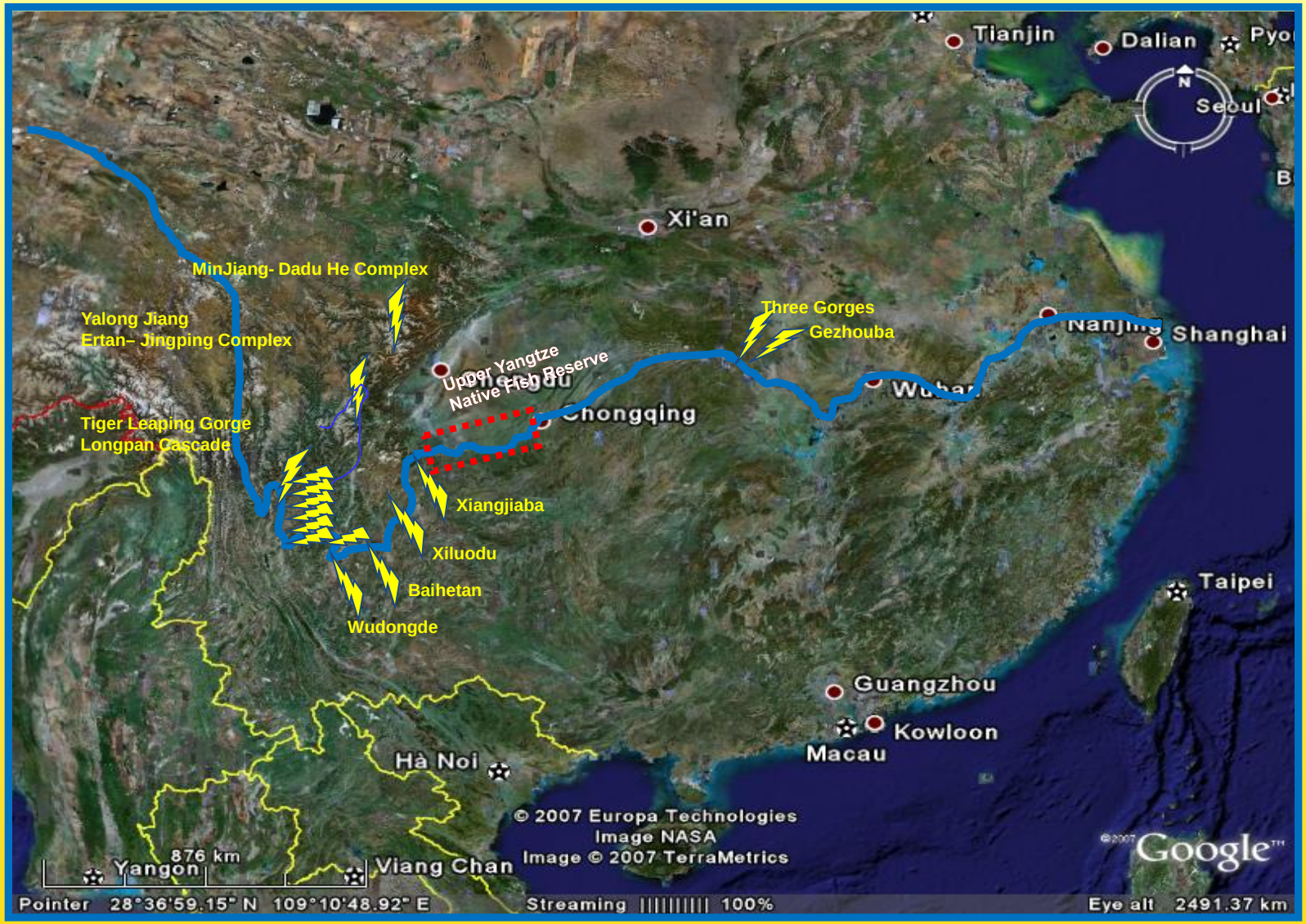




Yangzi River basin



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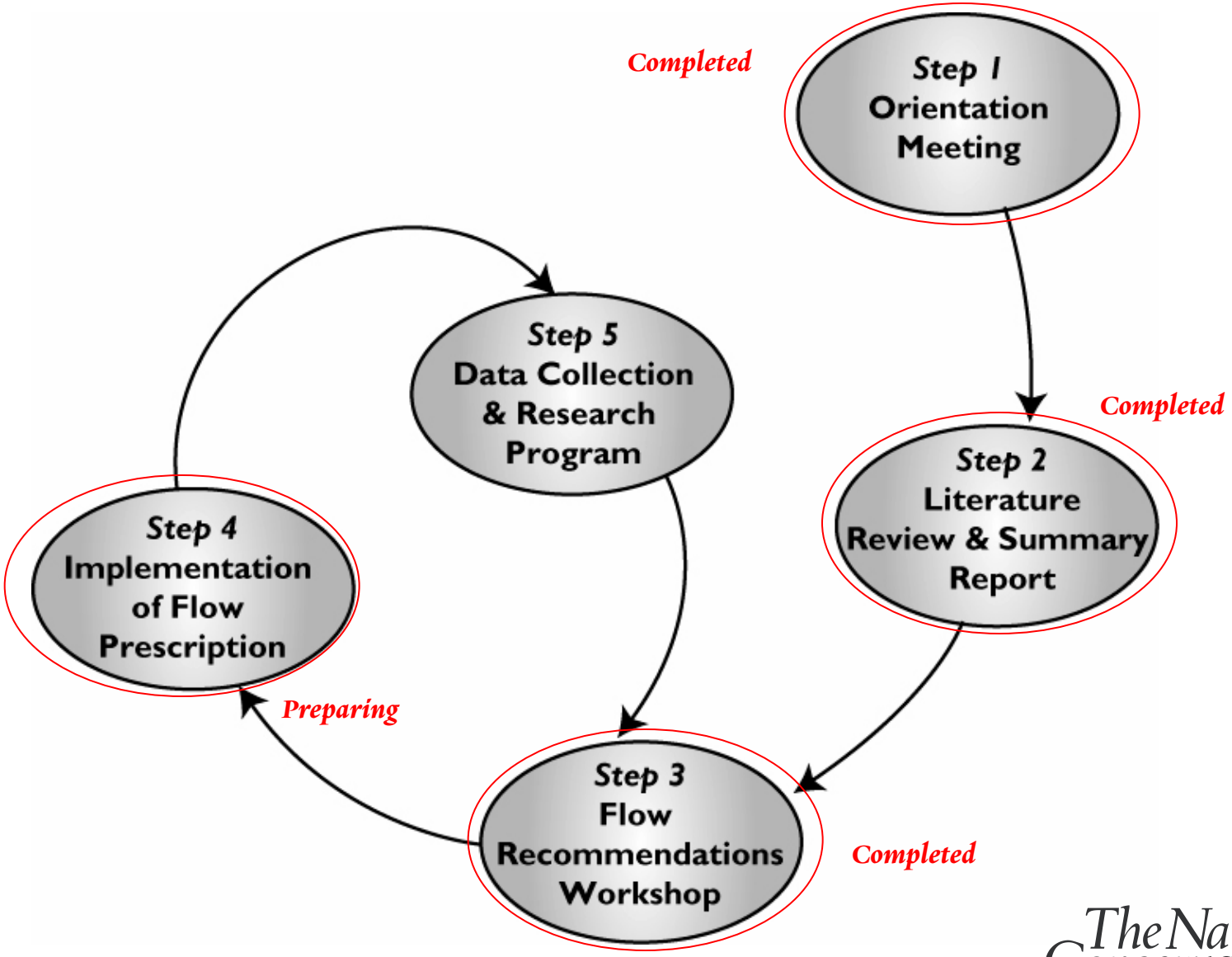
Savannah Process



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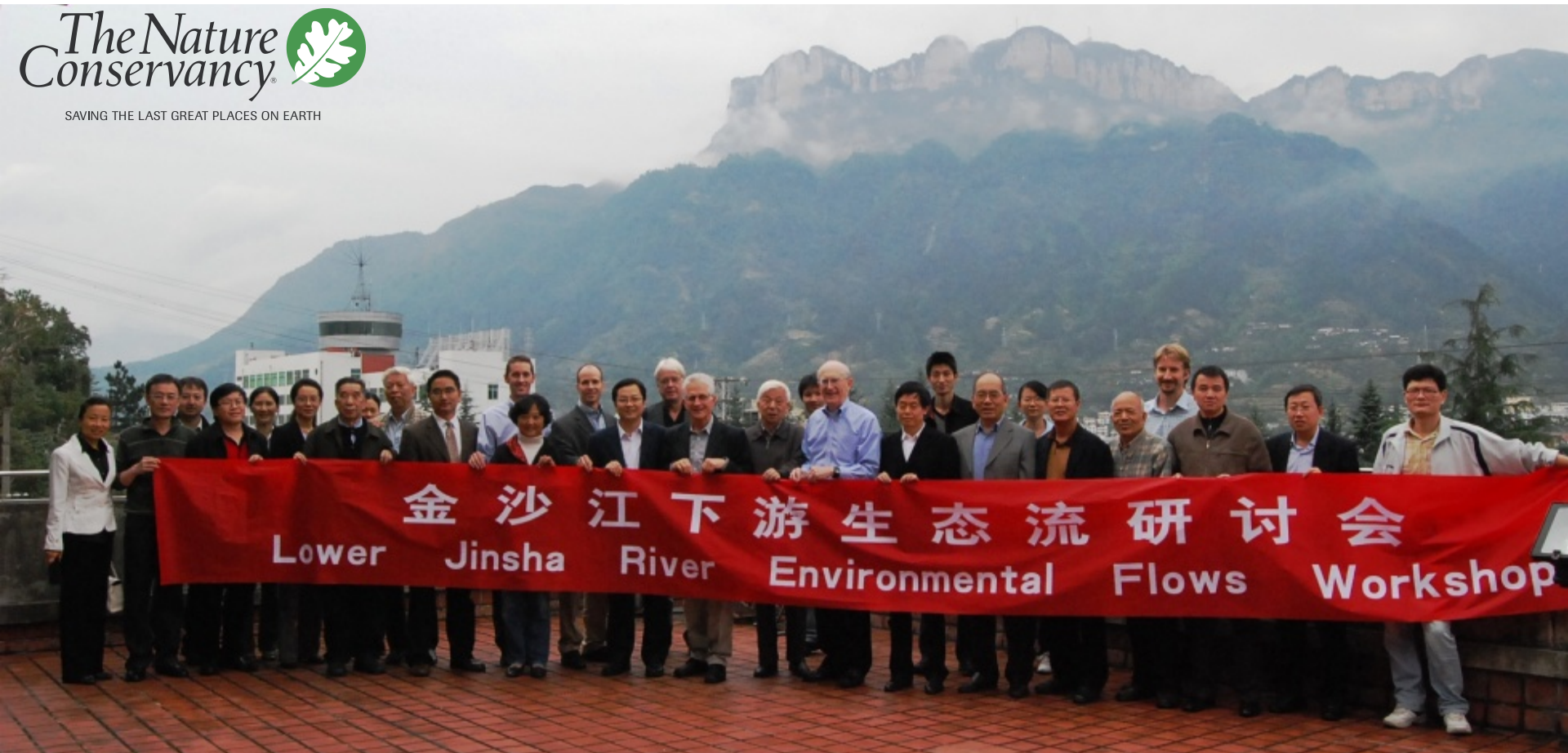
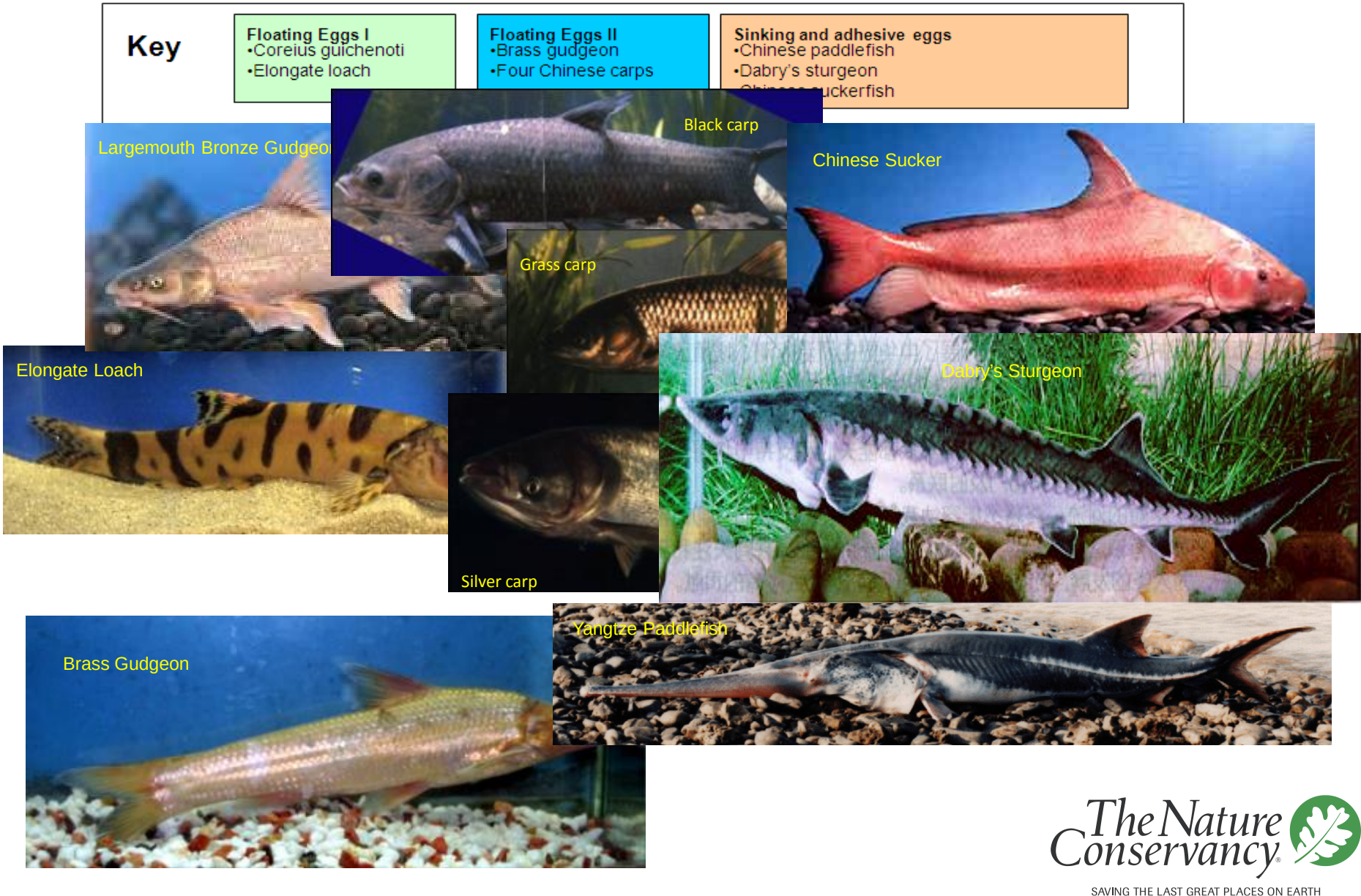


Flow-related ecological functions
Upper Yangtze Native Fish Reserve



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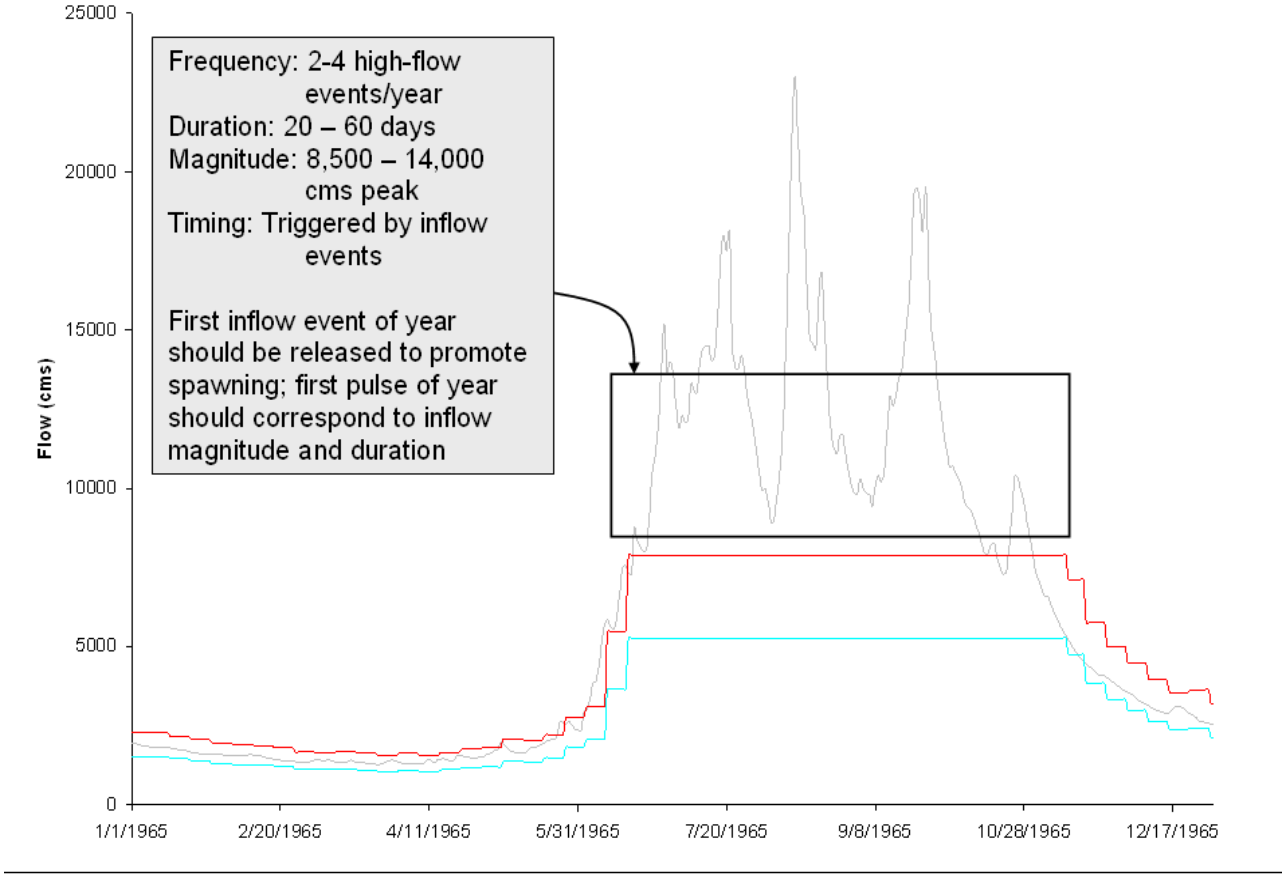
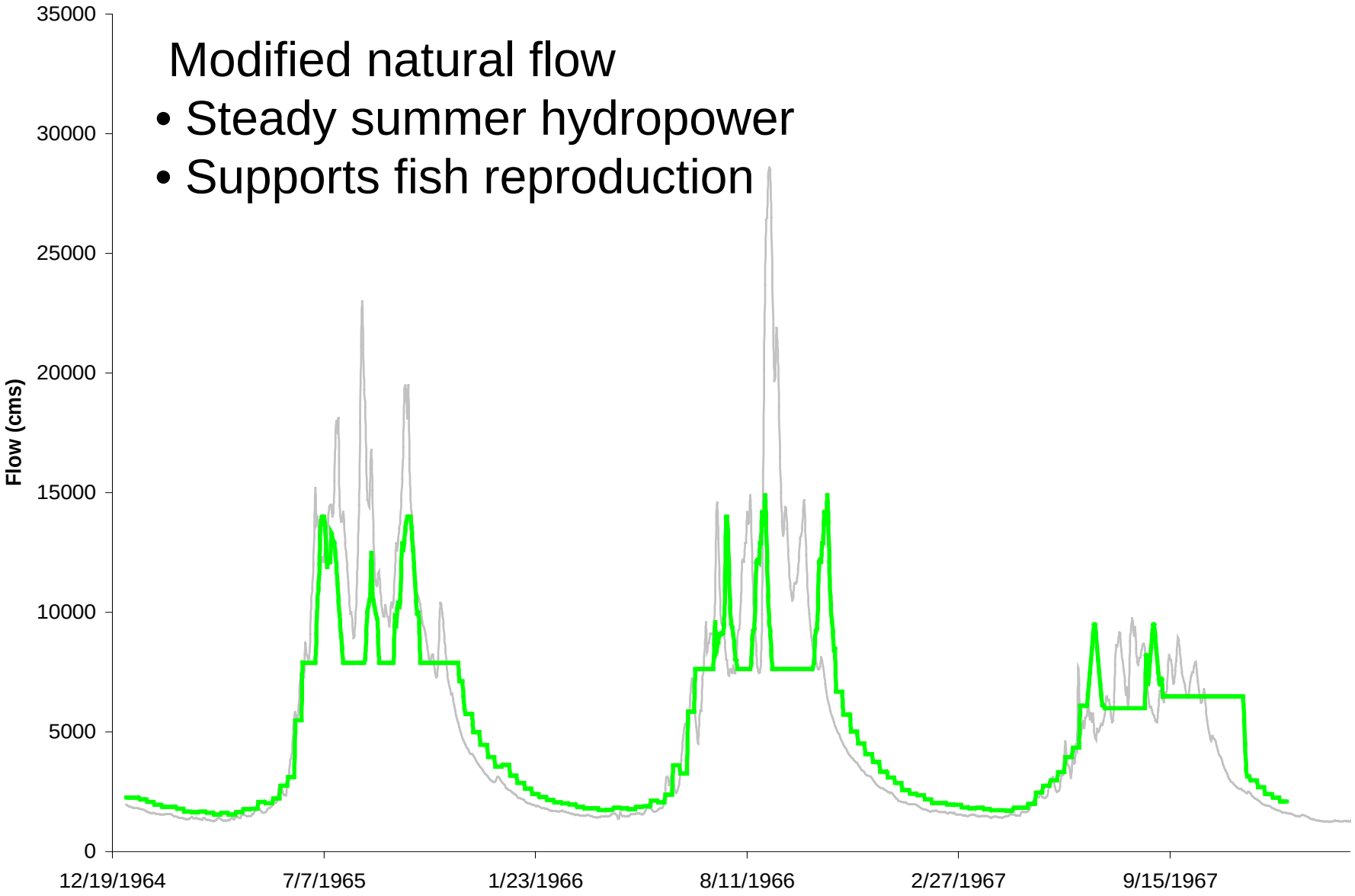
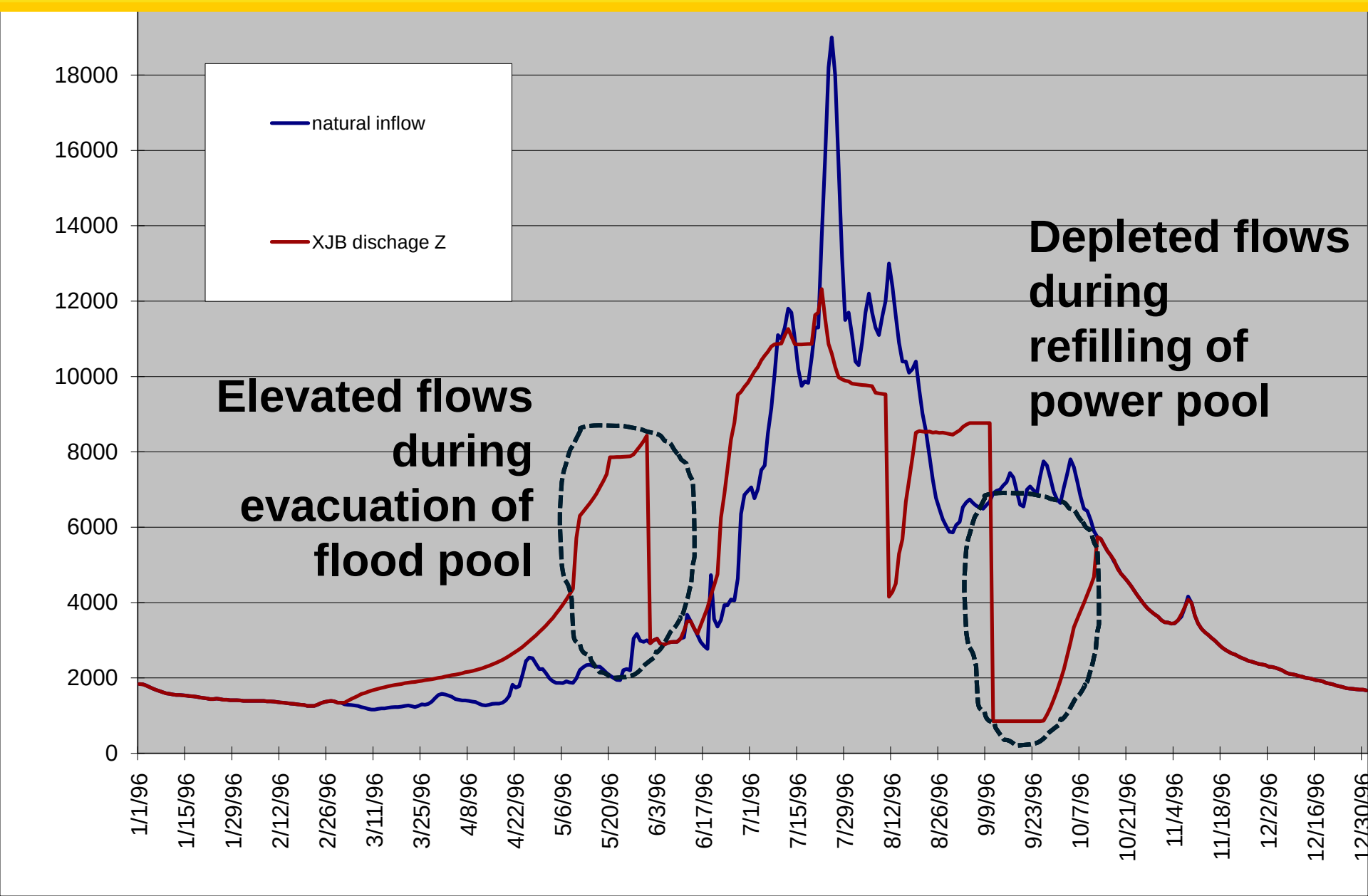
Environmental flow “building blocks”



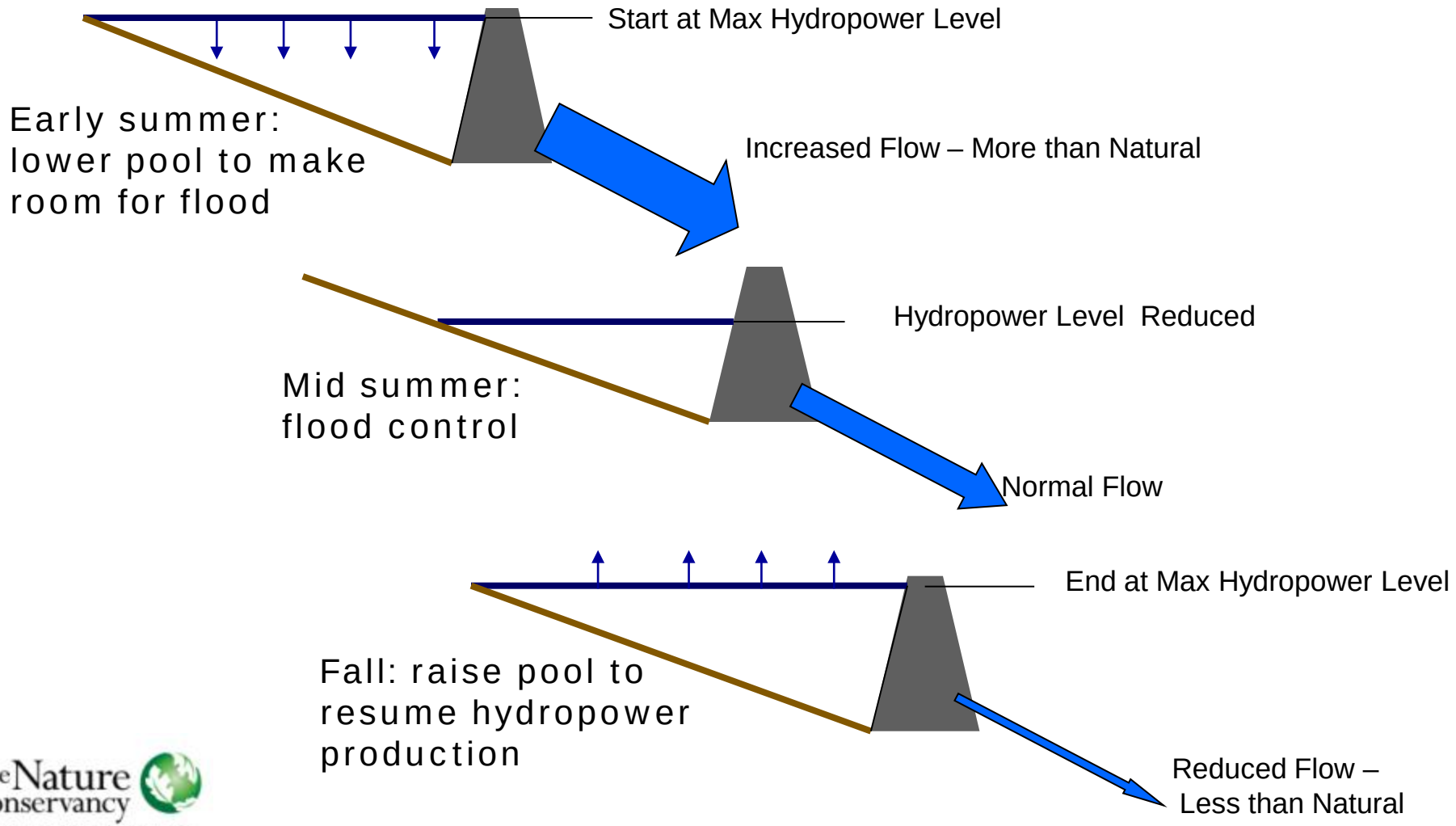
Flow regimes that meet the recommendations



Flood control prevents fish reproduction



Flood control reduces hydropower generation



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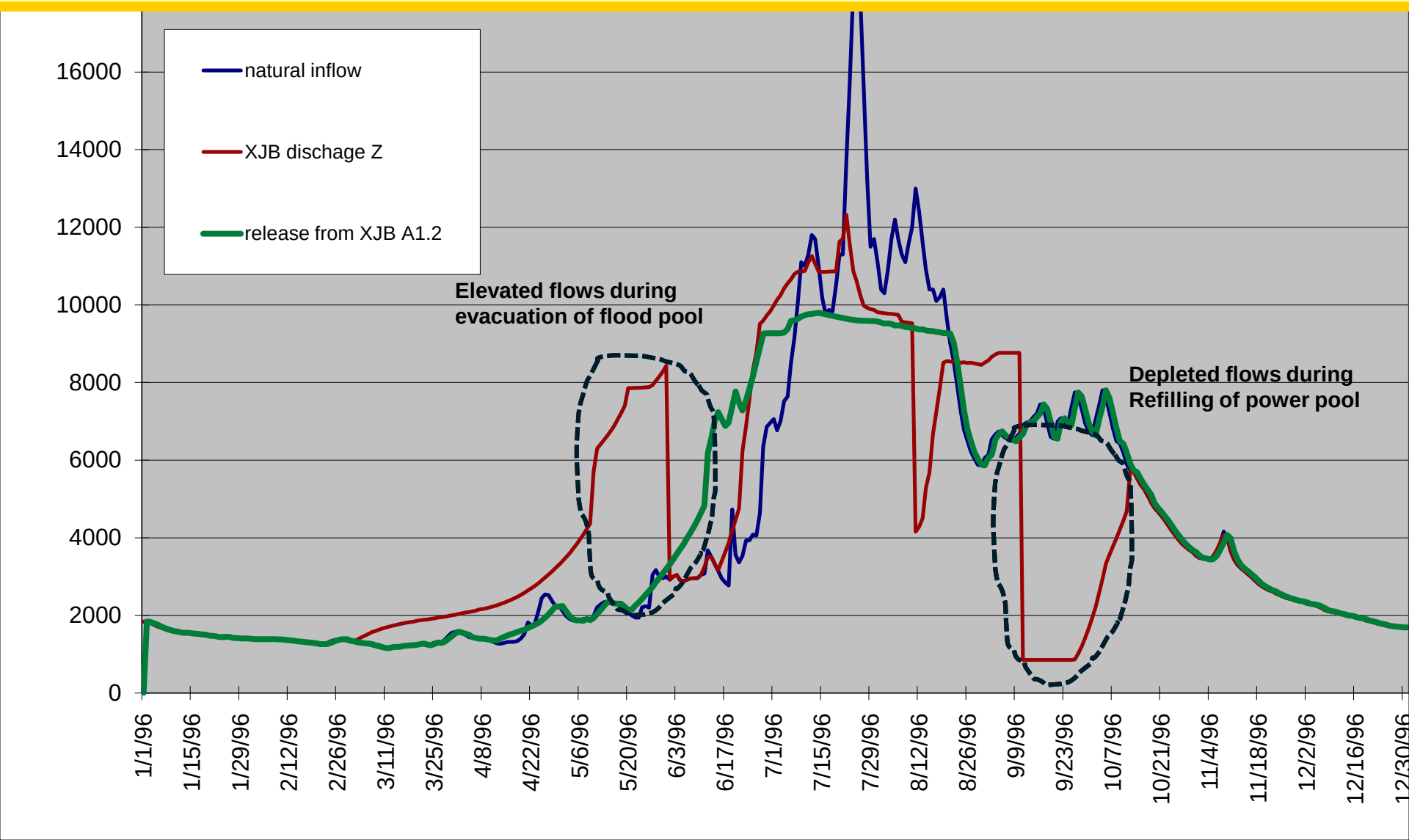
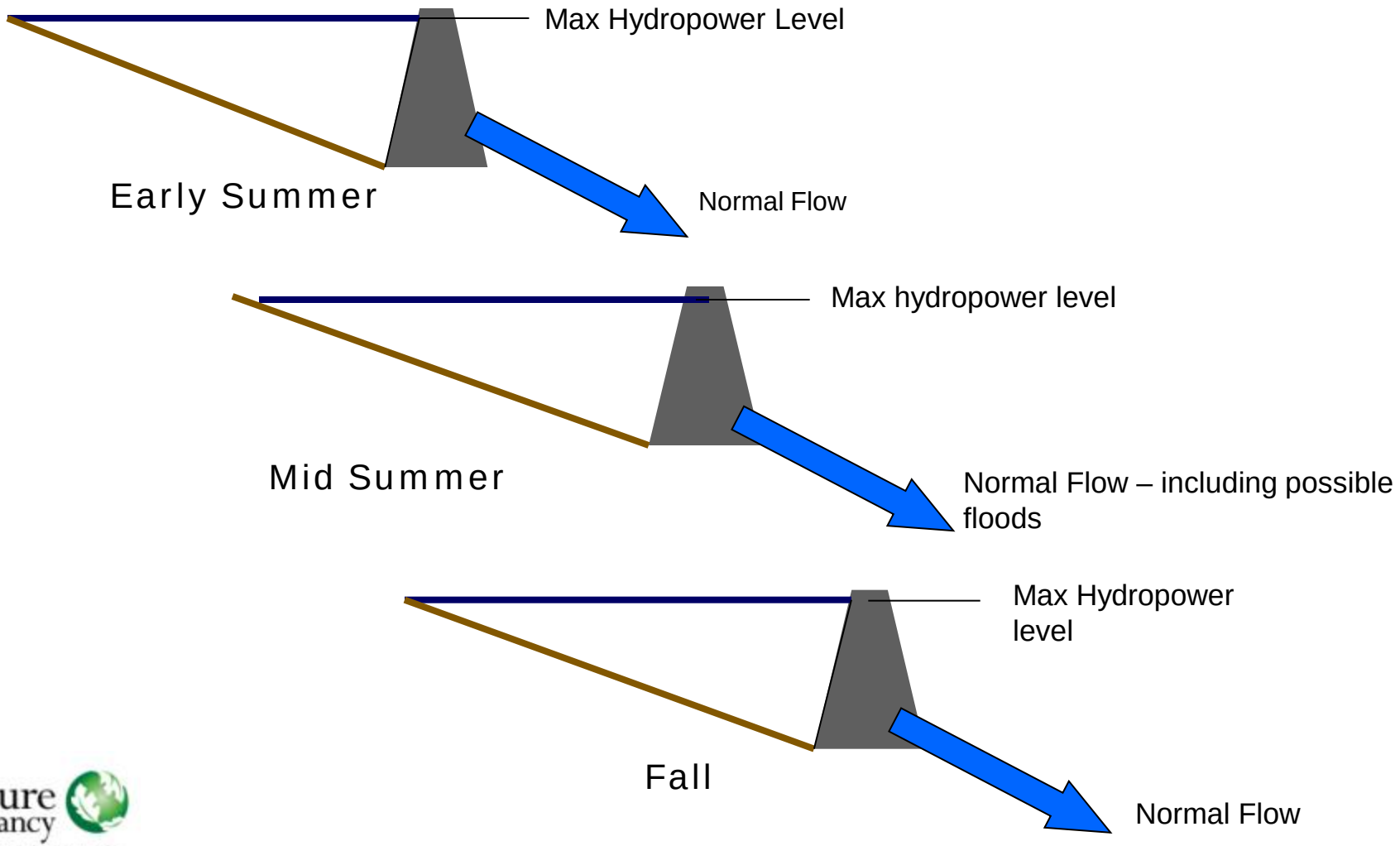
Modeled flow without flood protection



Less flood control = more hydropower, more fish



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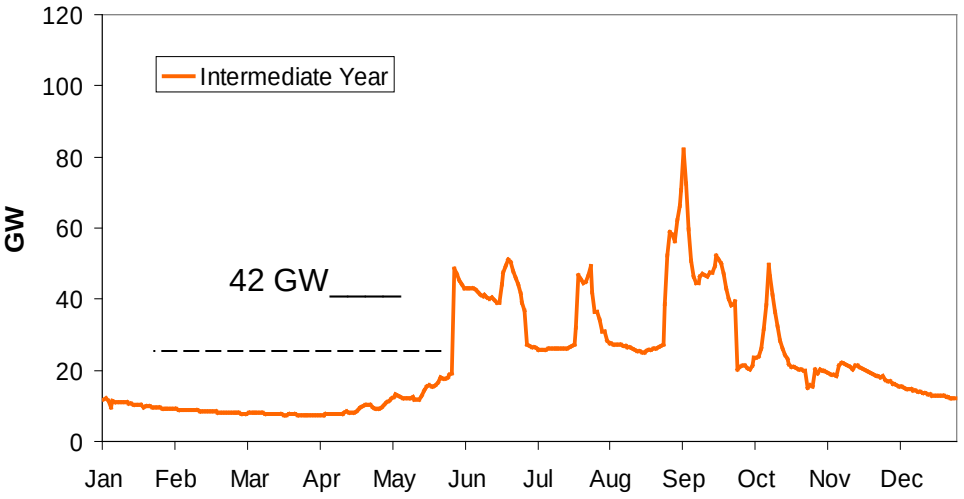
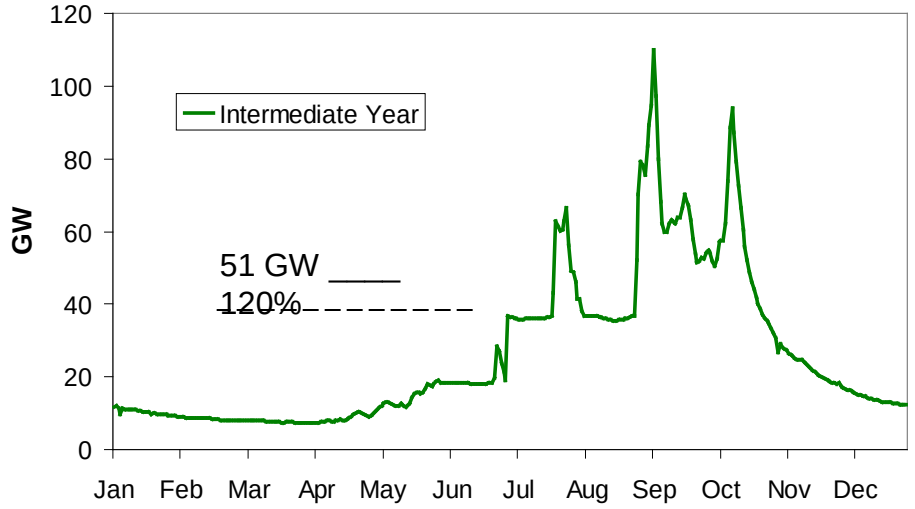
More hydropower = more revenue

Reliable Summer Capacity
With flood control

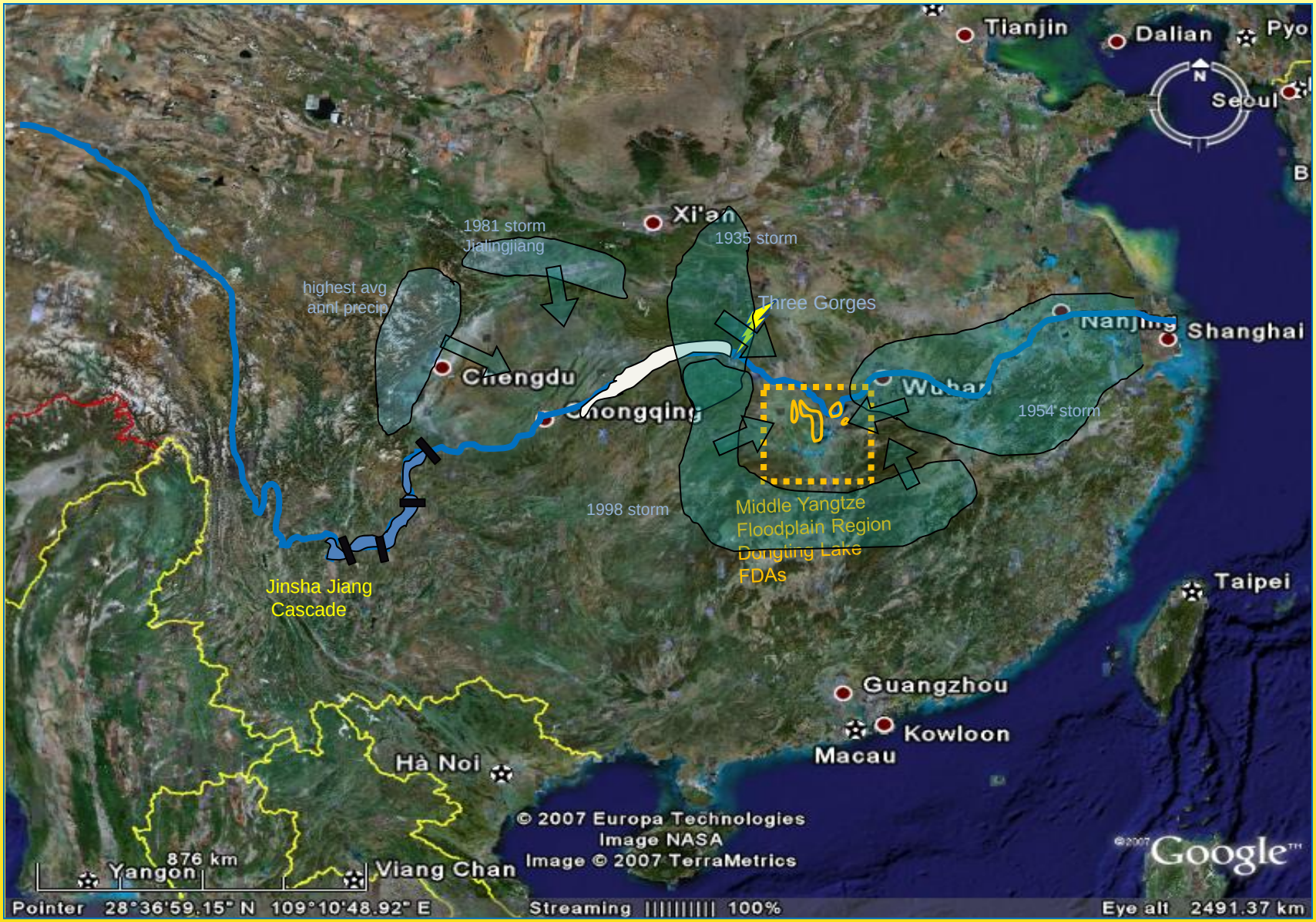


Reliable Summer Capacity
Without flood control

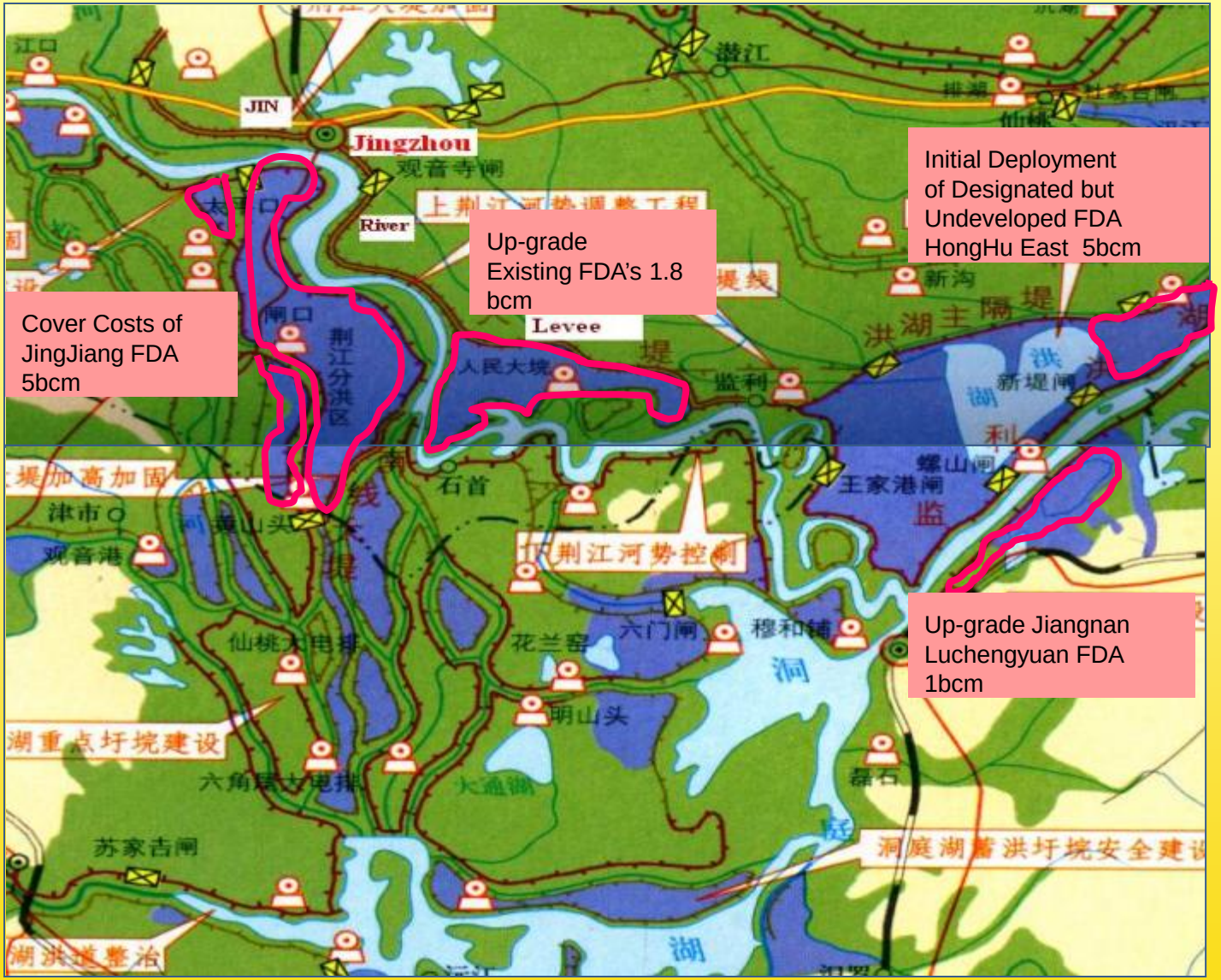


+ ~$670 million/year

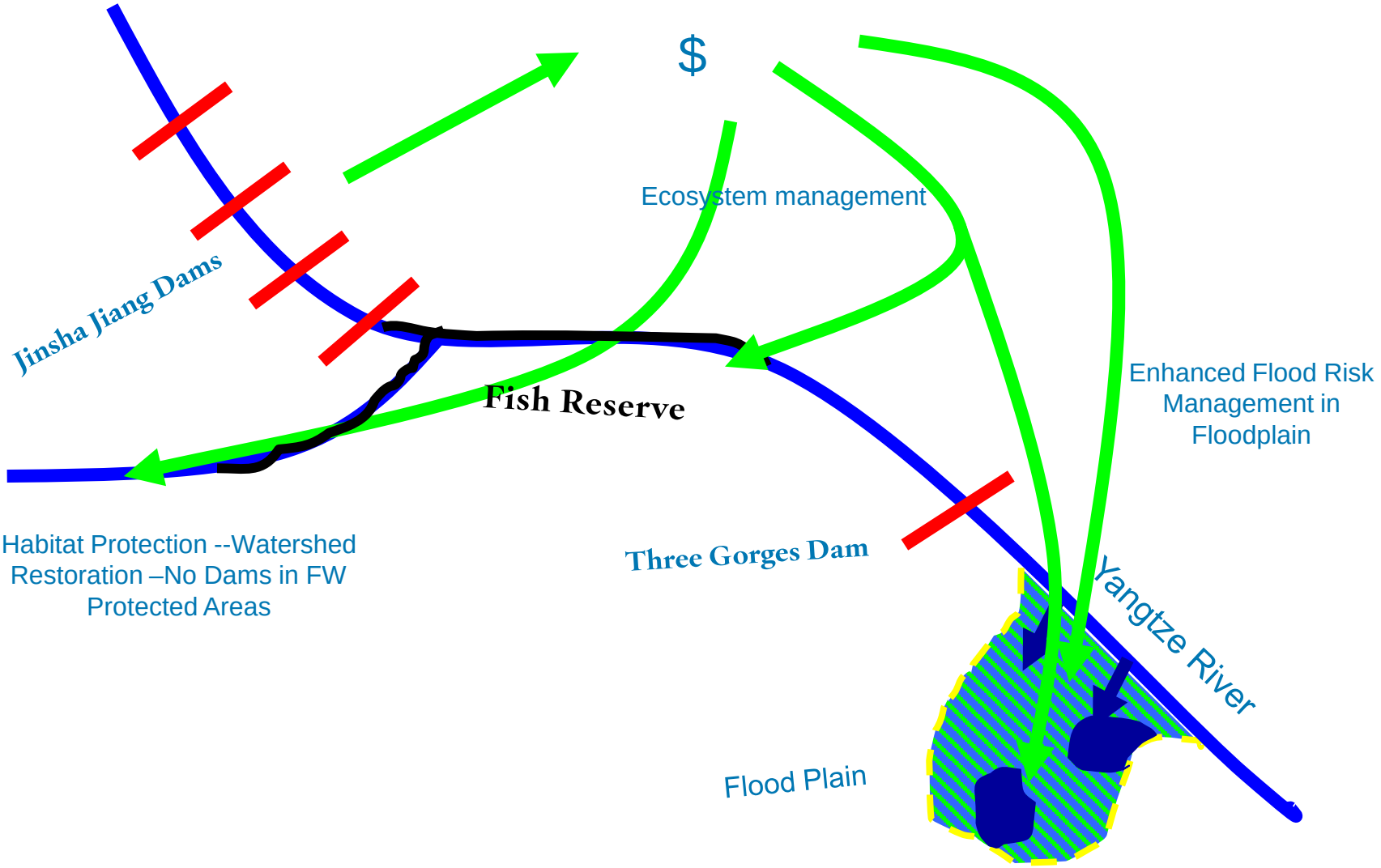
Flood Risk Management?



Flood Risk Management in the Flood Plain



Hydropower Sustainability Fund



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By KATHIE BASSETT

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Group of Chinese scientists visits Cape Girardeau to study Mississippi River Basin

Monday, August 10, 2009
By Bridget DiCosmo ~ Southeast Missourian

Chinese call the nearly 4,000-mile Yangtze River the "golden waterway" or "river of mother," and Americans have dubbed the Mississippi River "Old Man River," but the roles the two large waterways play in the economy and development of their respective nations are similar.

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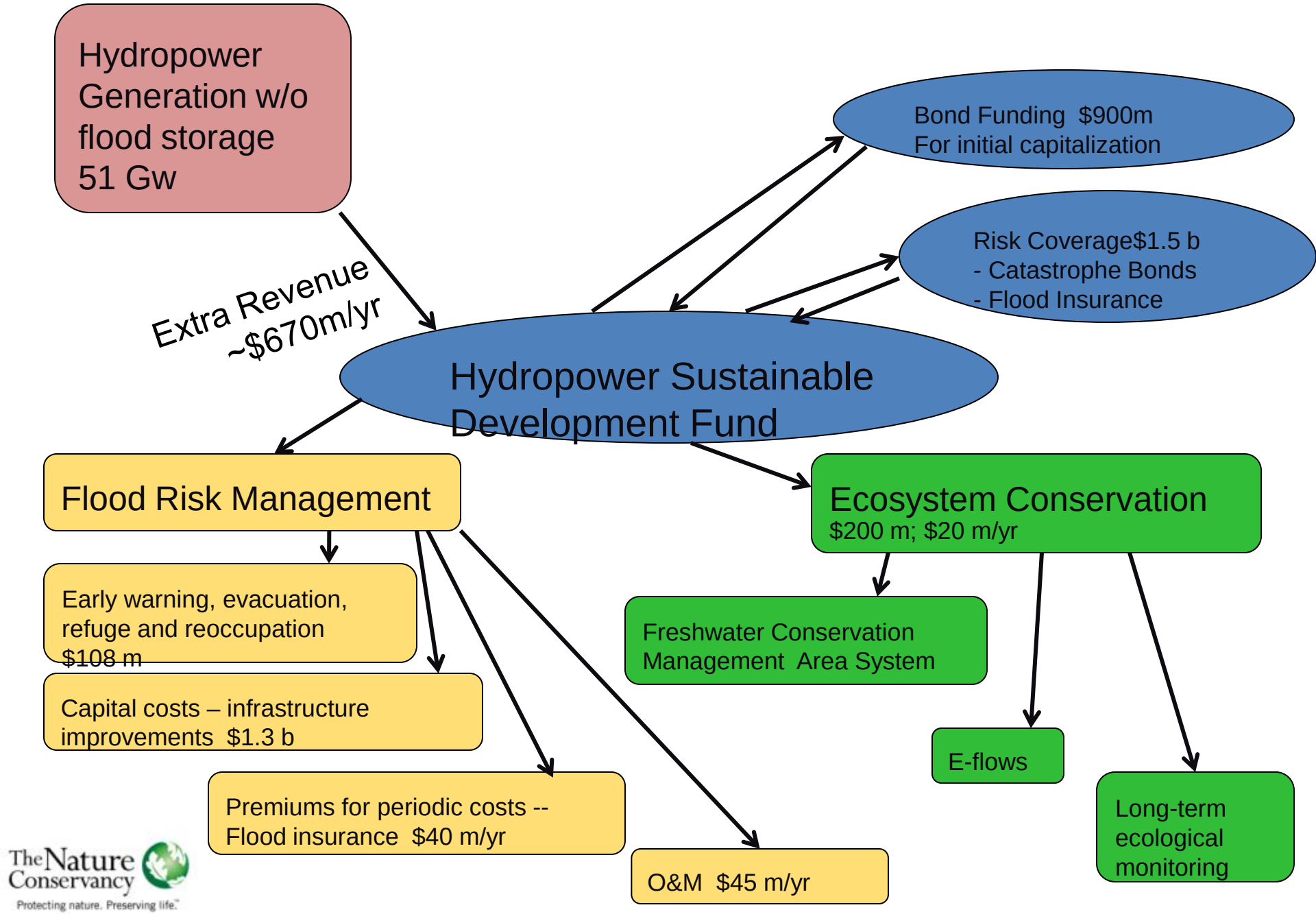
Yangtze River
Freshwater Ecoregional Assessment


Yangtze River Basin
Freshwater Conservation Management Areas
Tibetan Plateau Water Source Wetlands
Yangtze Estuary
Daduhe Fish Area
Yalongjiang Fish Area
Chengdu
Chongqing
Wuhan
Hefei
Nanjing
Shanghai
Hangzhou
Taihu
Poyang Lake
Nanchang
Honghu Lake Restoration
Flood Plain Lake Reconnection WWF
Dongting Lake and Wetlands
Changsha
National Native Fish Reserve
Guiyang
Kunming
Middle Jinshajiang
Hanjiang
Yangtze
Wujiang
Xiangjiang
Legend
Provincial Capital
National Native Fish Reserve
Yangtze River Main Stream
Main Tributaires
Lake
Fresh Water Conservation Management Areas
0 125 250 500 Kilometers
0 55 110 220 Miles


Hydropower Generation w/o flood storage 51 Gw
Extra Revenue ~$670m/yr
Bond Funding $900m For initial capitalization
Risk Coverage$1.5 b - Catastrophe Bonds - Flood Insurance
Hydropower Sustainable Development Fund
Flood Risk Management
Ecosystem Conservation $200 m; $20 m/yr
Early warning, evacuation, refuge and reoccupation $108 m
Capital costs – infrastructure improvements $1.3 b
Premiums for periodic costs -- Flood insurance $40 m/yr
O&M $45 m/yr
Freshwater Conservation Management Area System
E-flows
Long-term ecological monitoring
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Some Lessons Learned

- **Need to coordinate multiple stakeholders**
- **Major water managers must lead – Three Gorges Company and Yangtze Basin Commission**
- **Synergies of integrating water management functions:**
  - **More energy**
  - **More money**
  - **More flood protection**
  - **More healthy ecosystems**

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