Planning at the System Scale – The Next Frontier of Hydropower Sustainability

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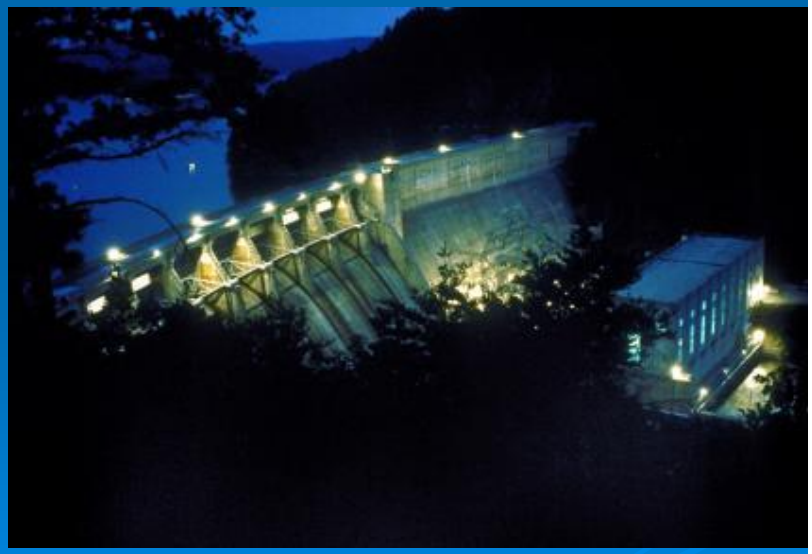
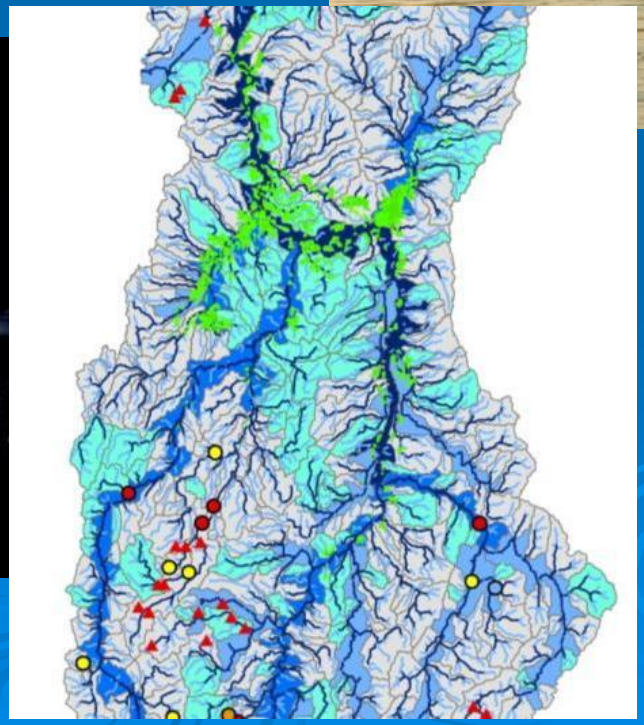
Global Hydropower Initiative
Expert Workshop
David L. Harrison TNC Global Freshwater
23-24 April 2014 Washington, D.C.





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Basic Premise: Planning at the basin scale can optimize hydropower, social and ecosystem values -- and help avoid risks

- Through smart planning at the river basin scale, a country or region can have *both* major infrastructure development *and* preserve environmental and social values that come from rivers
- Good dam locations and designs, good conservation areas using conservation priority area mapping, finding the "best fit"

- "Hydropower by Design"
- "Sustainable Portfolios of Projects"
- "Right Projects, Built Right"

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How does this link to Protocol

- Early Stage
  - ES-1 Demonstrated Need
  - ES-2 Options Assessment
  - Policies and Plans
- Project Preparation
  - P-3 Demonstrated Need and Strategic Fit
  - P-4 Siting and Design
- Working Group to review Early Stage Tool to push toward a stronger system-level planning protocol

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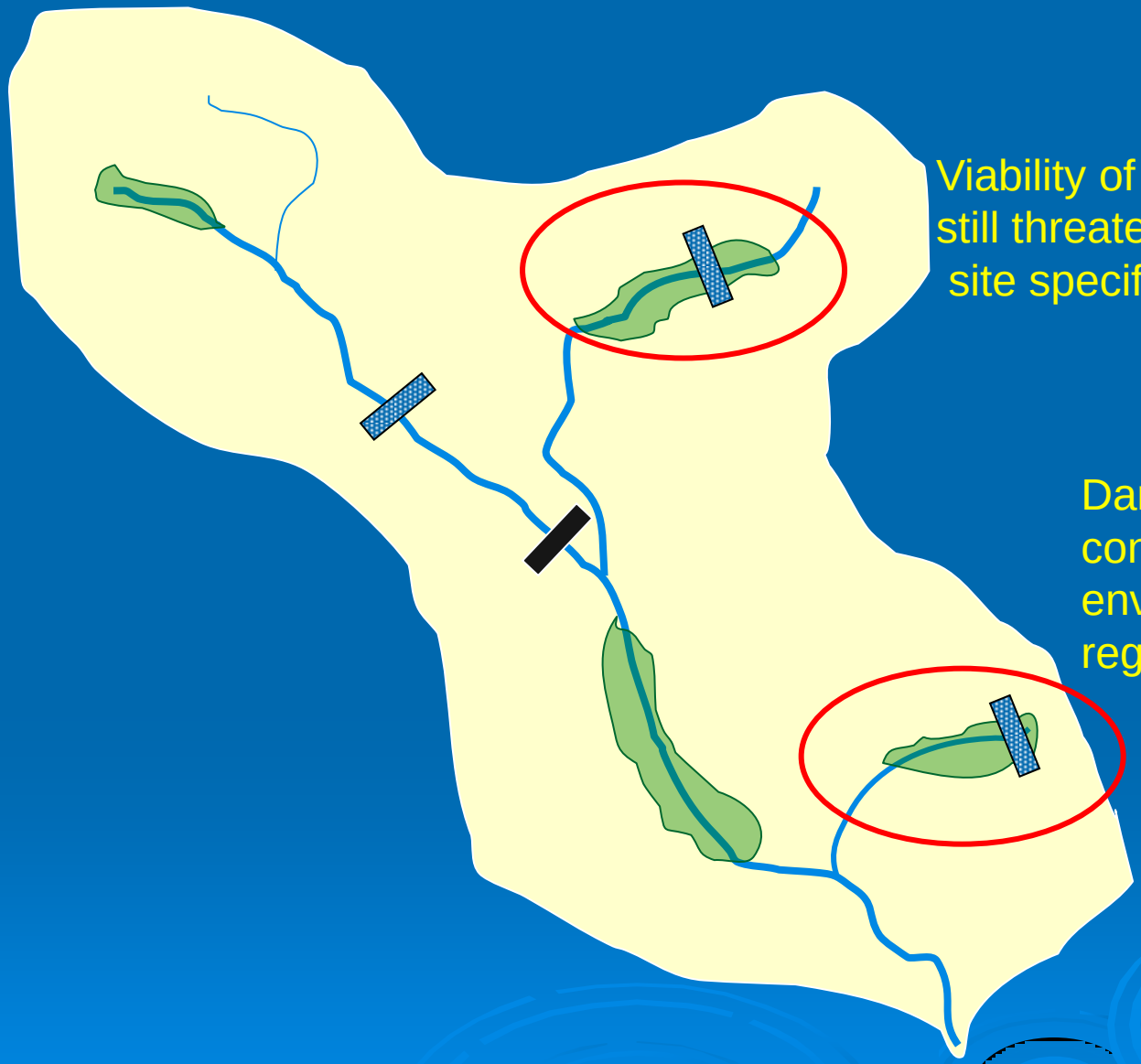
Lack of integrated planning



Viability of conservation areas still threatened even with site specific mitigation

Dam operations constrained by environmental flow regime

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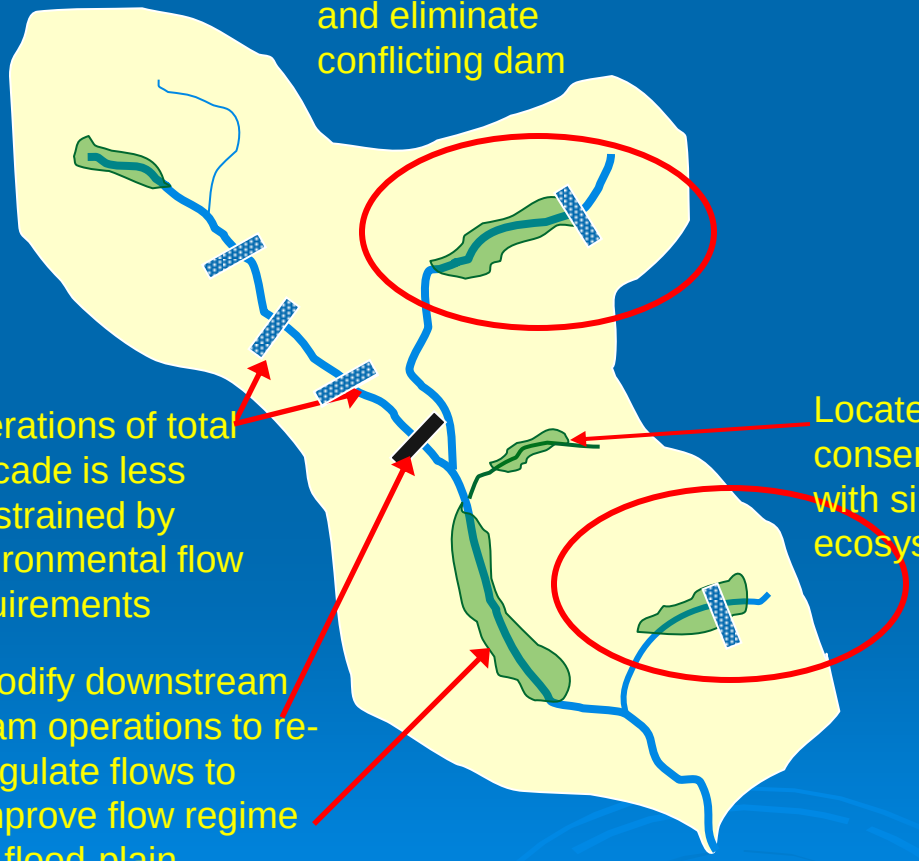
Cross-compare Scenarios
Look for better fit



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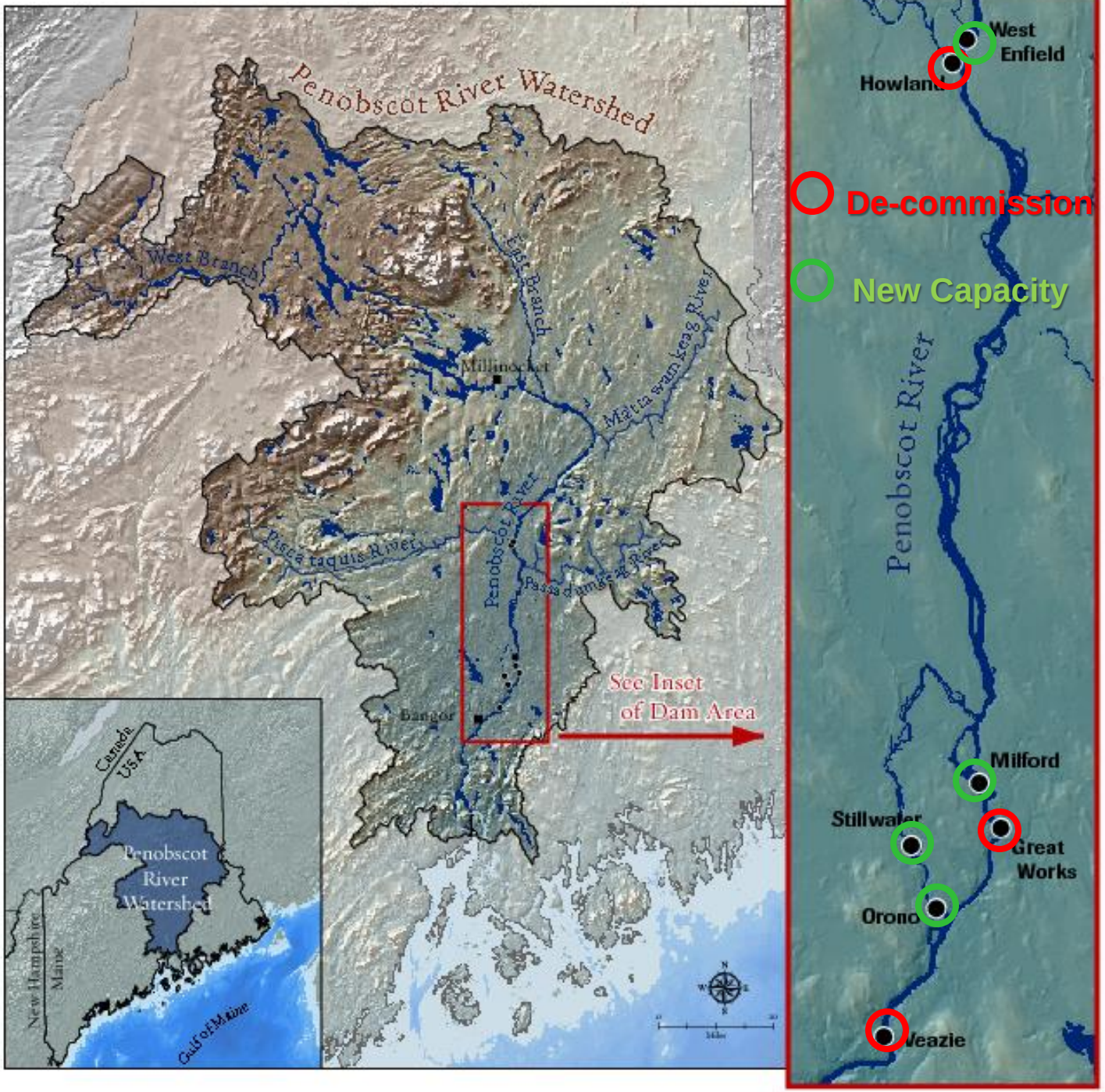
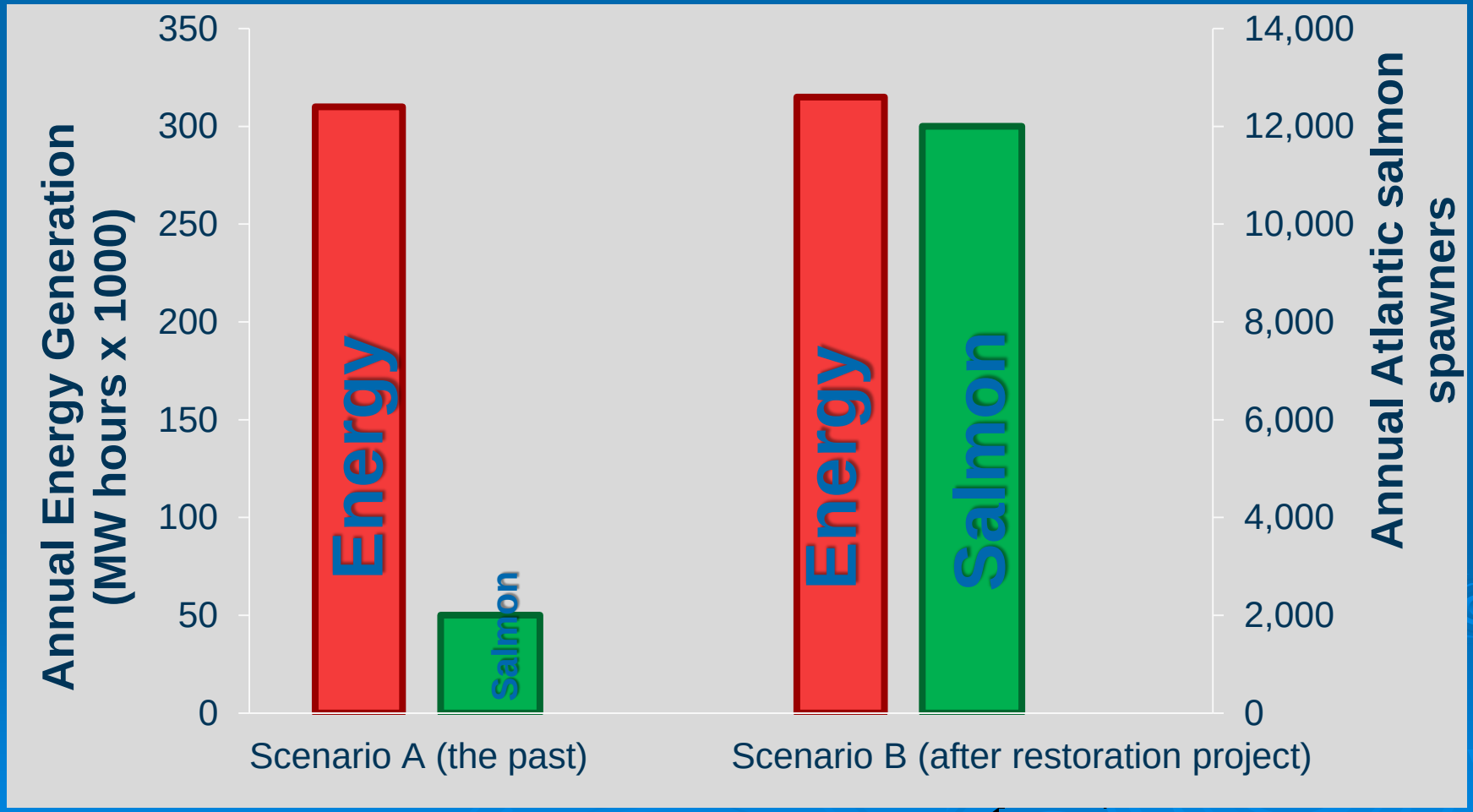

Penobscot River Watershed
West Branch
East Branch
Millinocket
Mattawamkeag River
Penobscot River
Passadumkeag River
Piscataquis River
Bangor
See Inset of Dam Area
Canada
USA
Penobscot River Watershed
New Hampshire
Maine
Gulf of Maine
West Enfield
Howland
De-commission
New Capacity
Penobscot River
Milford
Stillwater
Great Works
Orono
Veazie

Penobscot Results



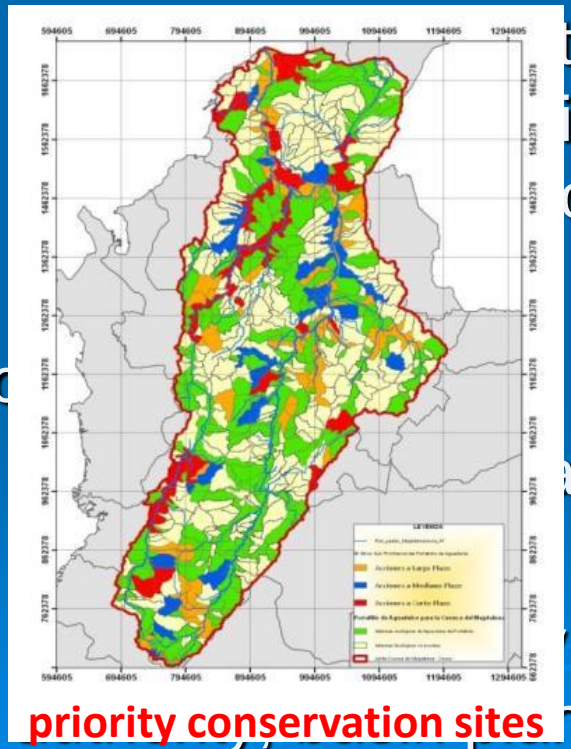
What is needed for System Planning based on Scenario Analysis?

Technical

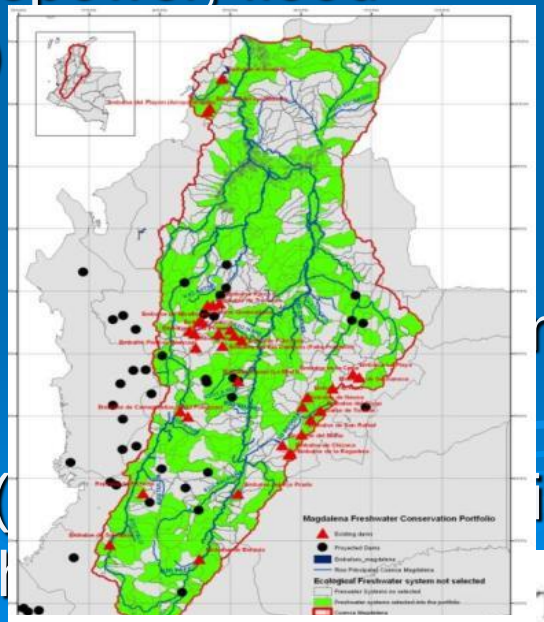
1. Conservation priorities mapping (habitats, migratory connections, ecosystem services areas, indigenous areas, areas of importance to local people,)
2. ty for hydropower and other water ing (hydropower, flood cial, etc.)

Polic

1. ation with nd
2. entities (ing nning auth



priority conservation sites



Current and planned dams

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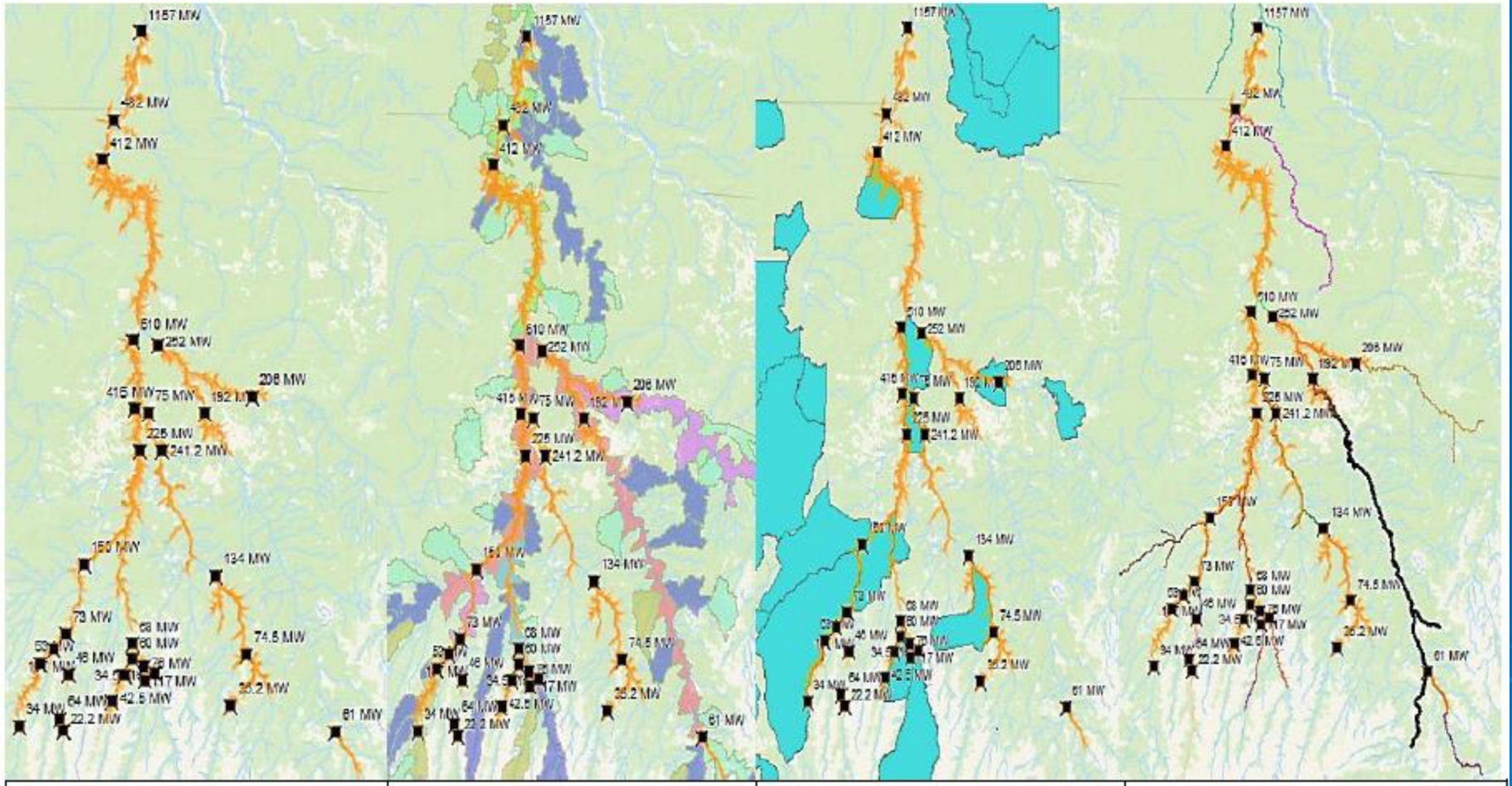
Figure 1. Maps of Scenarios

Scenario One --Full Hydropower Potential



Footprint of Direct Impacts (Dams and Reservoirs)	Direct Impact Footprint on Conservation Portfolio	Direct Impact Footprint on Indigenous Lands	Dam Impact on river Connectivity

Scenario Analysis Results

Scenario	Name	Cost	Hydro	Indig.	Biodiv.	Connect.
1	Full Hydropower Potential	100%	100%	55%	51%	14%
2	Minimize Indigenous Impact	88%	45%	91%	77%	48%
3	Minimize Biodiversity Impact	89%	14%	86%	100%	81%
4	Develop 60% of Hydro	104%	62%	59%	68%	17%
5	Protect 60% Indigenous	103%	76%	73%	66%	17%
6	Protect 60% Biodiversity	96%	42%	59%	68%	24%
7	Max develop in lower river (1)	105%	61%	77%	73%	27%
8	Max develop in lower river (2)	108%	43%	64%	72%	35%
9	Free upper SW tribs	110%	32%	73%	82%	44%
10	Free lower and east tribs (1)	111%	49%	64%	74%	61%
11	Free lower and east tribs (2)	108%	53%	59%	72%	54%
12	Free east tribs	110%	61%	55%	61%	30%

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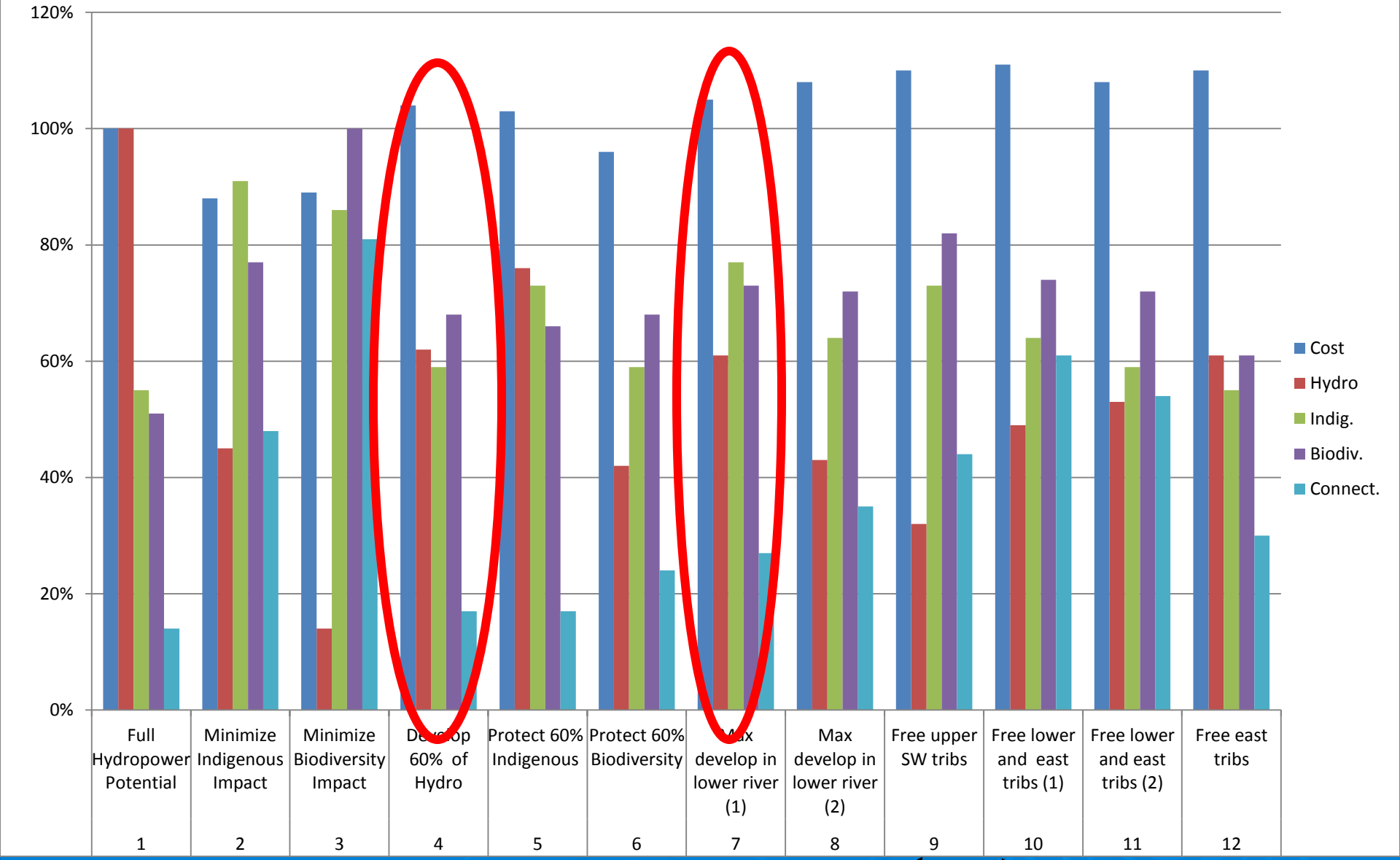

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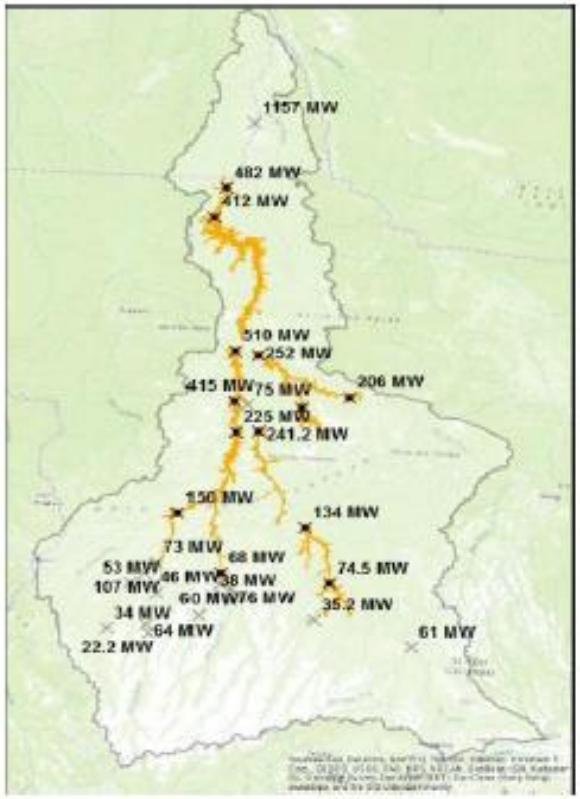
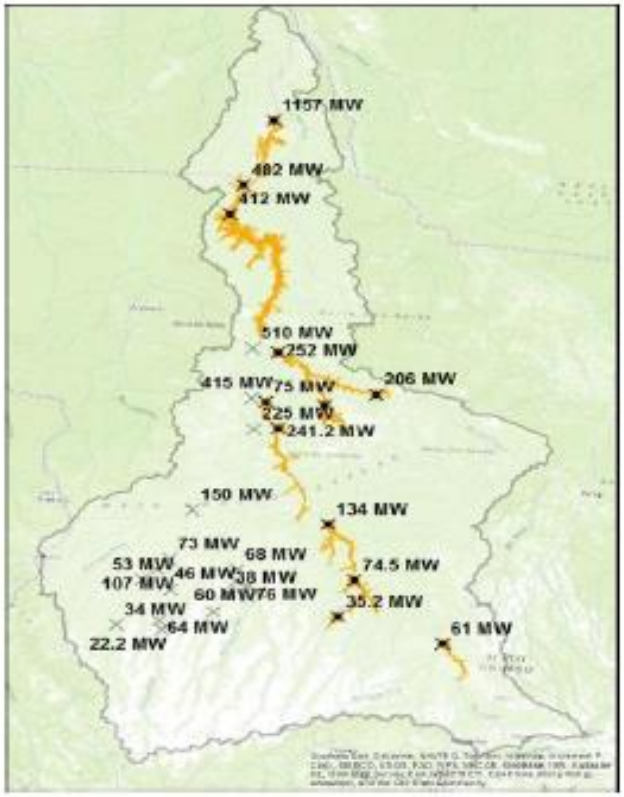
Scenario 4



Value	Percent of Base
Hydropower	62%
Indigenous Intact	59%
Biodiversity Intact	68%
Connectivity Intact	17%

Scenario 7



Value	Percent of Base
Hydropower	61%
Indigenous Intact	77%
Biodiversity Intact	73%
Connectivity Intact	27%

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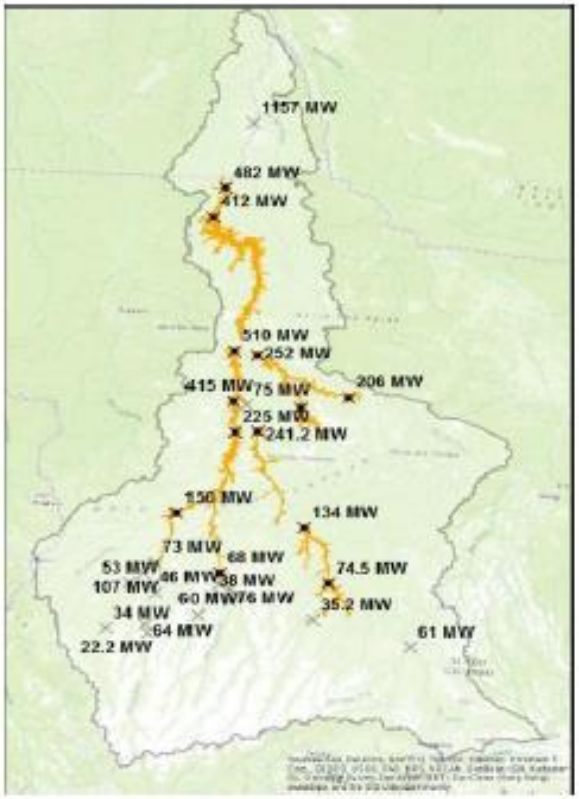
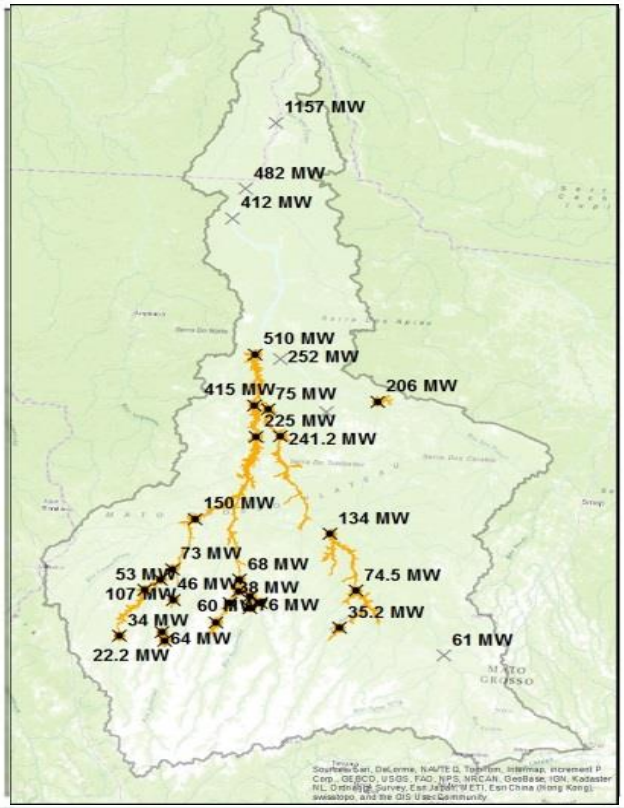
Scenario 4		Scenario 11	
			
Value	**Percent of Base**	**Value**	**Percent of Base**
Hydropower	62%	Hydropower	53%
Indigenous Intact	59%	Indigenous Intact	59%
Biodiversity Intact	68%	Biodiversity Intact	72%
Connectivity Intact	17%	Connectivity Intact	54%

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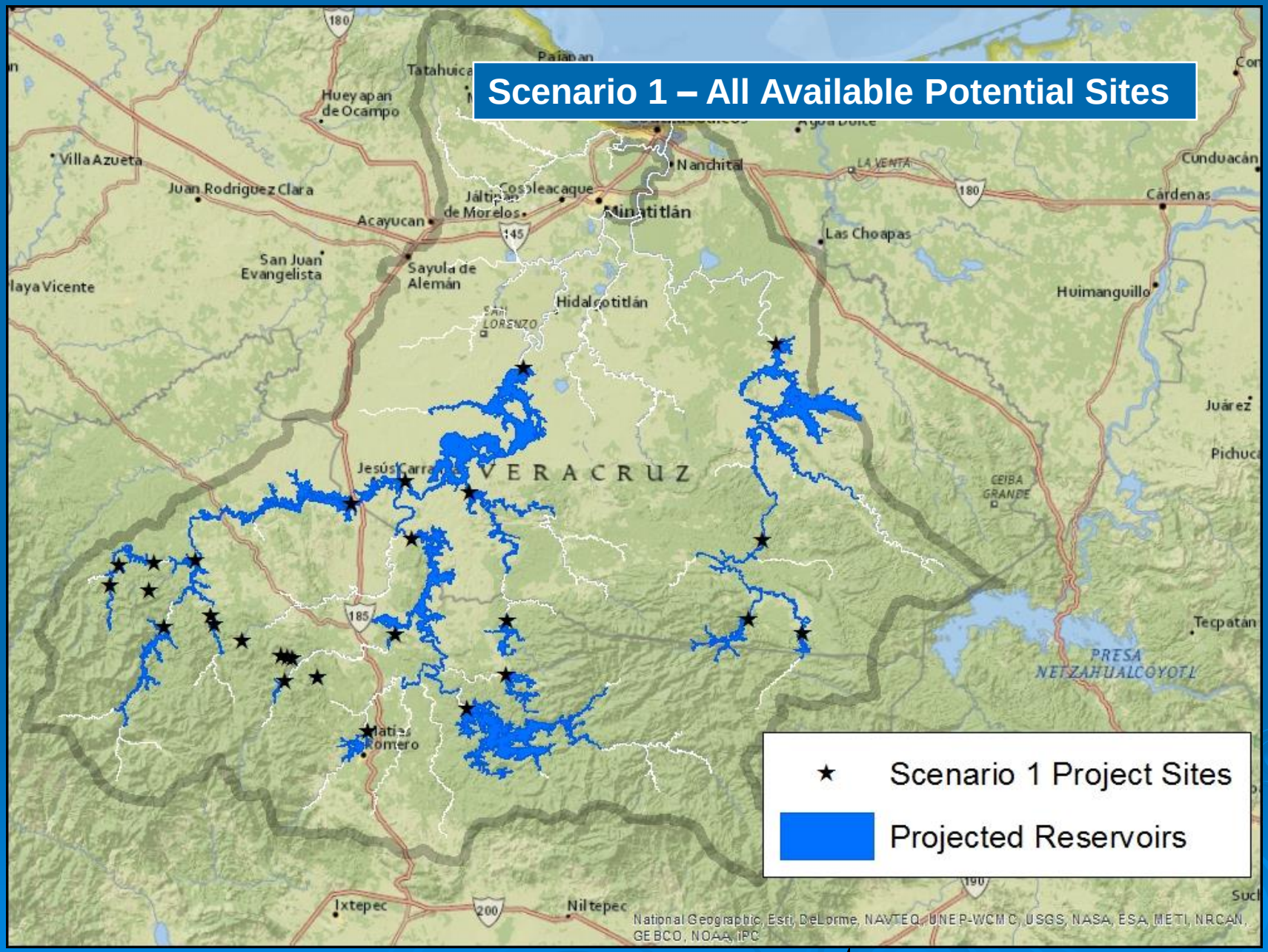
Scenario 1 – All Available Potential Sites



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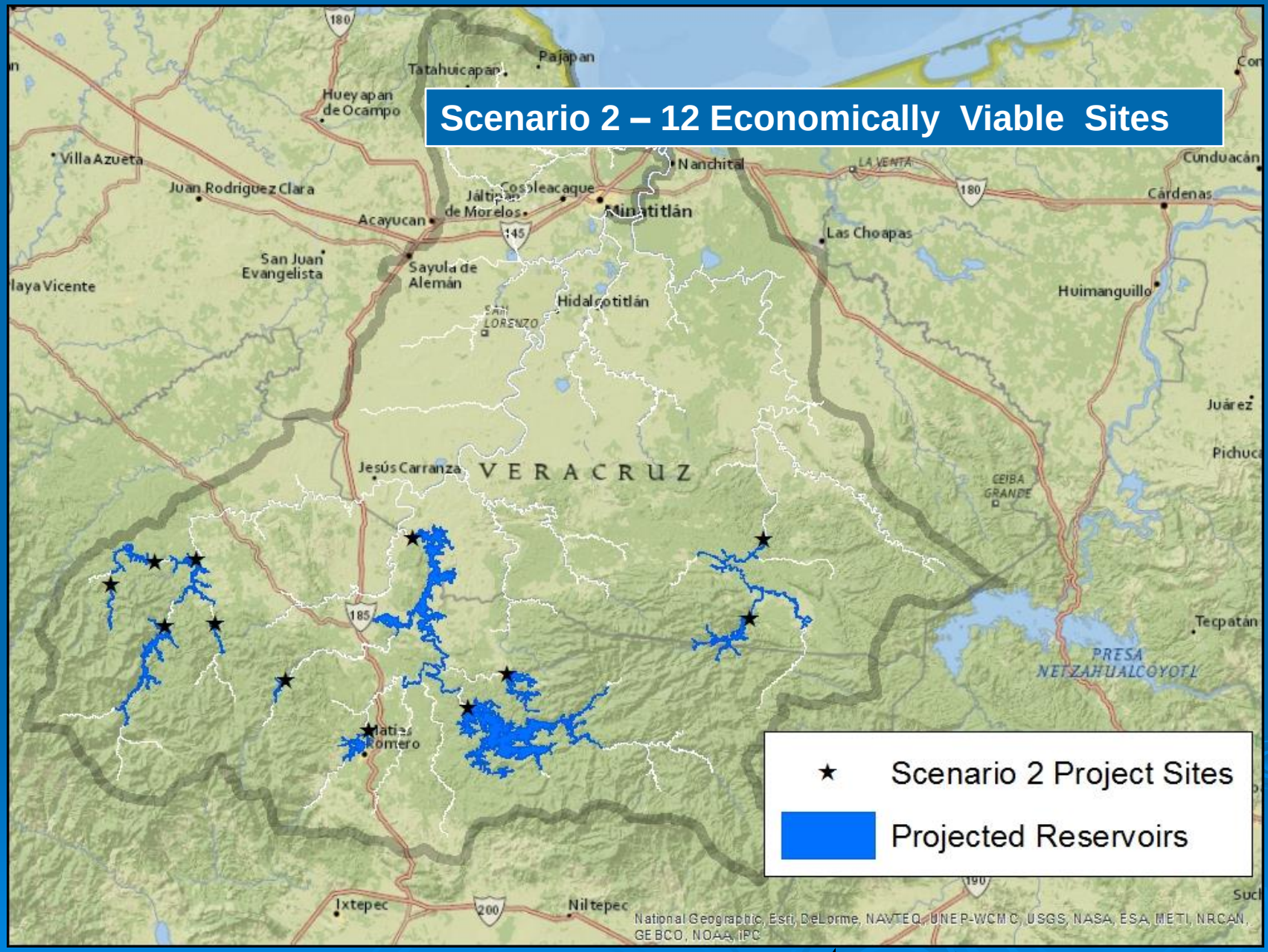

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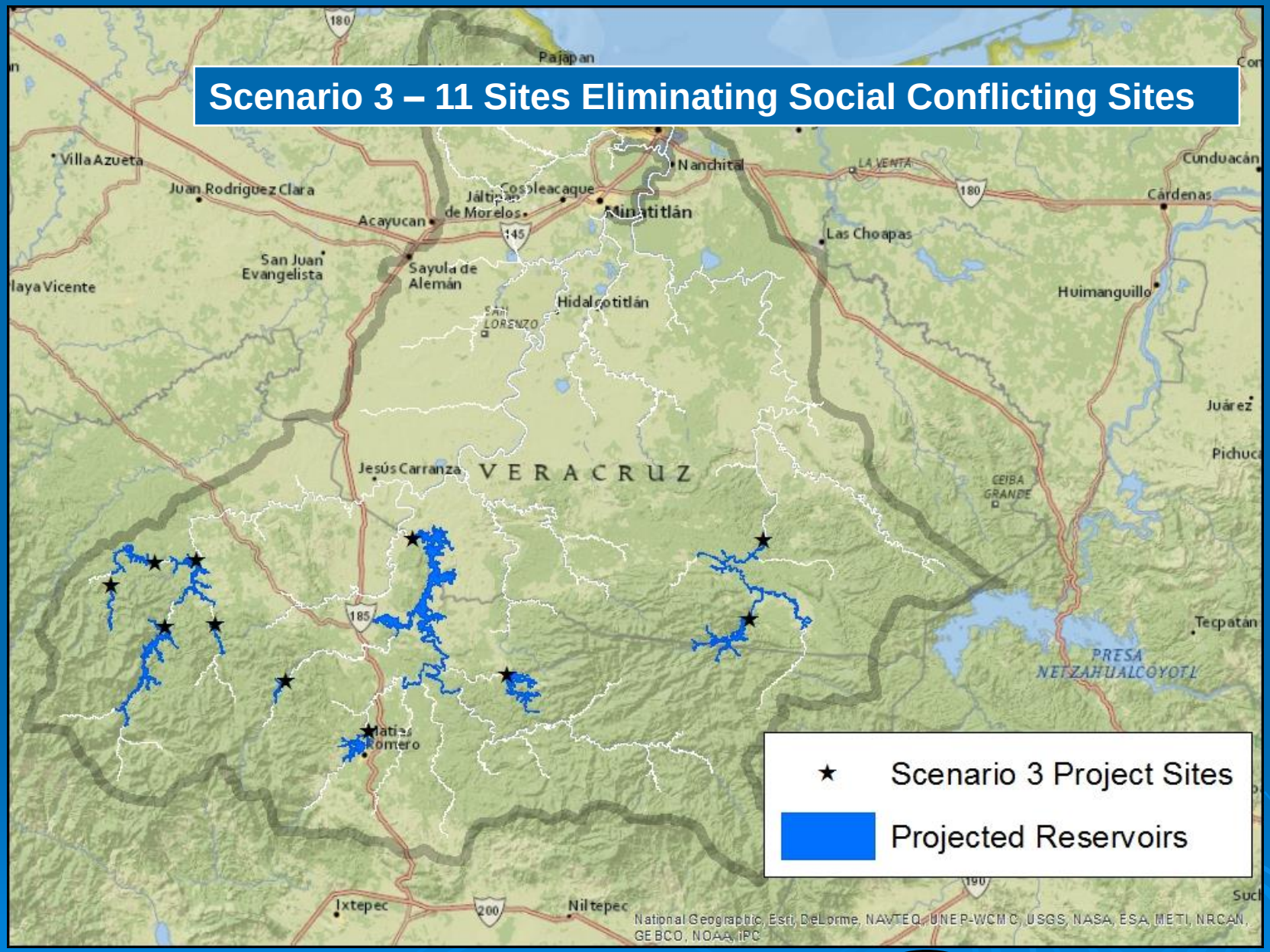
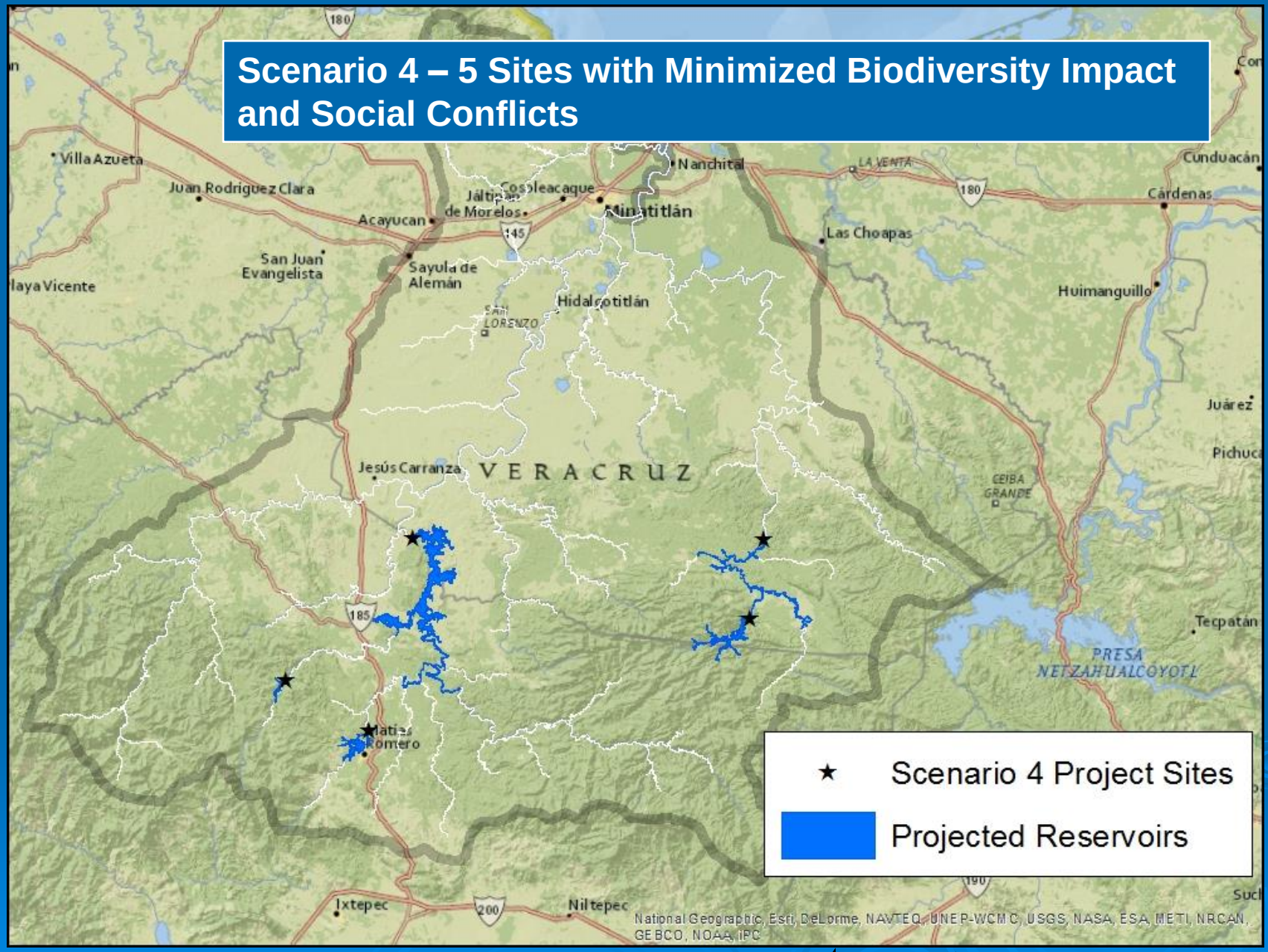
Scenario 3 – 11 Sites Eliminating Social Conflicting Sites



Scenario 4 – 5 Sites with Minimized Biodiversity Impact and Social Conflicts



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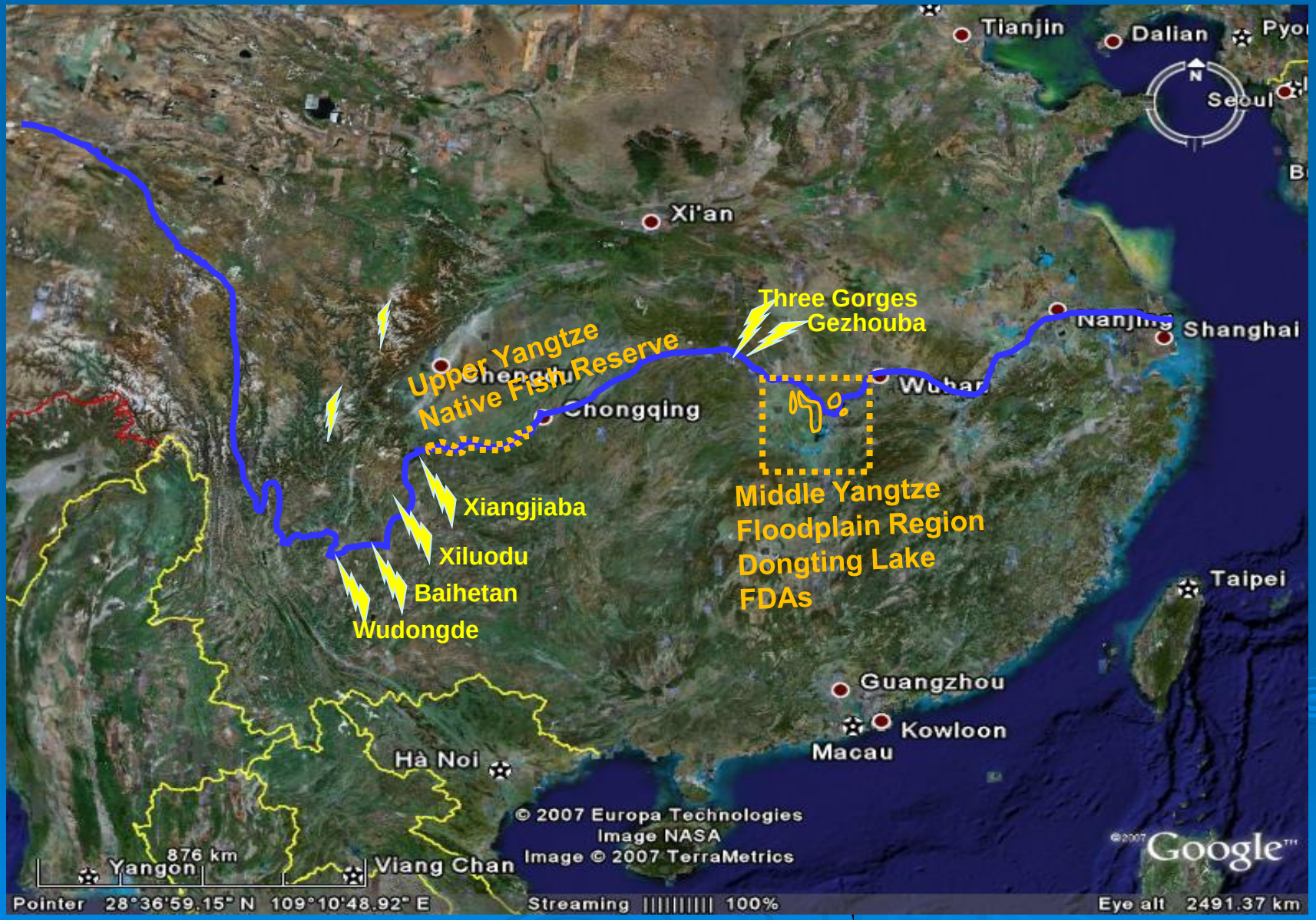
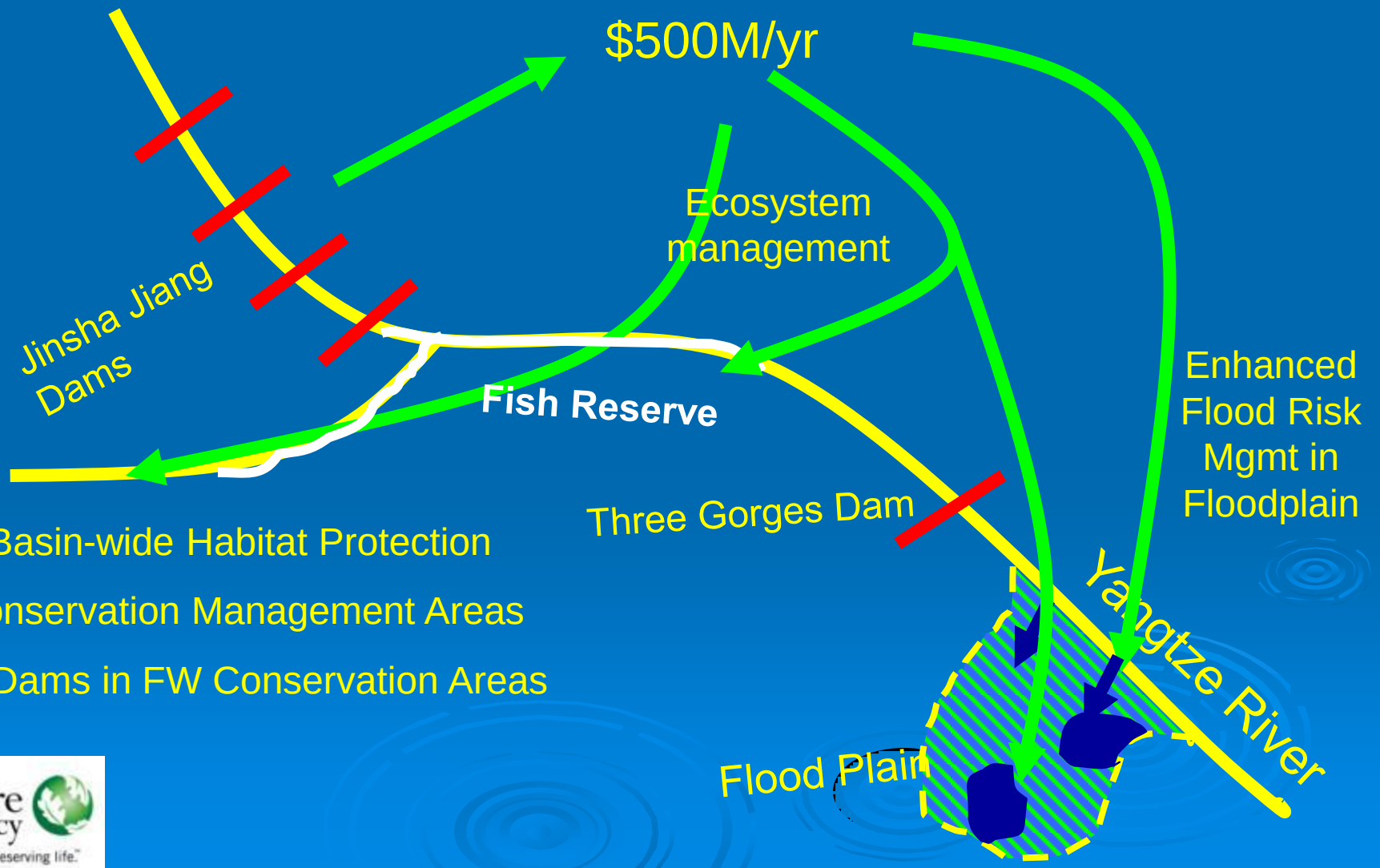
Coatzacoalcos Basin Mexico

	GENER'N POT'L MW	NUMBER OF PROJECTS	Percent Econom viable	TERREST'L GAP HA's IN RESERVOIRS	FW GAP HA's IN RESERVOIRS	NUMBER OF PEOPLE TO BE RELOCATED	NUMBER OF INDIG PEOPLE AFFECTED	RIVER SEGMENTS AFFECTED (Km's)	NUMBER OF UNFRAG'D RIVER SEGMENTS	LONGEST UNFRAG'D RIVER SEGMENT (Km's)
SCENARIO 1	520.6	28		25,156	47,653	17801	1,738	3,041	45	736
SCENARIO 2	391	12	100.0	20,098	19,662	2411	583	1,177	22	1515
SCENARIO 3	288	11	73.7	7,602	11,460	2166	583	799	19	1515
SCENARIO 4	172.6	5	44.1	2,488	6,837	1953	569	535	12	1728


Tianjin
Dalian
Seoul
Xi'an
Three Gorges
Gezhouba
Upper Yangtze
Native Fish Reserve
Chongqing
Shanghai
Xiangjiaba
Xiluodu
Baihetan
Wudongde
Middle Yangtze
Floodplain Region
Dongting Lake
FDAs
Taipei
Guangzhou
Kowloon
Macau
Hà Noi
Yangon
Viang Chan
876 km
© 2007 Europa Technologies
Image NASA
Image © 2007 TerraMetrics
Google
Pointer 28°36'59.15" N 109°10'48.92" E
Streaming 100%
Eye alt 2491.37 km

TNC Proposal for Integrated Flood Risk Management and Ecologically Sustainable Hydropower



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Key Issues for next level of work

- **Who will use this kind of planning approach?**
  - **Role of Government agencies in licensing?**
  - **Civil Society Stakeholders**
  - **Industry, Developers**
  - **Financiers**

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Key Issues for next level of work

- **Who will pay for these early, pre-project planning efforts?**
  - **Sustainable development loan funds**

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Key Issues for next level of work

- **How to deal with social impact and Indigenous Peoples impact measures?**
  - **Subjective social values**
  - **Ethno-mapping**
  - **Direct participation in planning**

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Key Issues for next level of work

- **Where to push system-level planning demonstrations?**
  - **TNC engaged in Coatzacoalcos basin in Mexico;**
  - **Tapajos in Brazil;**
  - **Magdalena, Colombia;**
  - **Oguooe River, Gabon, Africa**

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