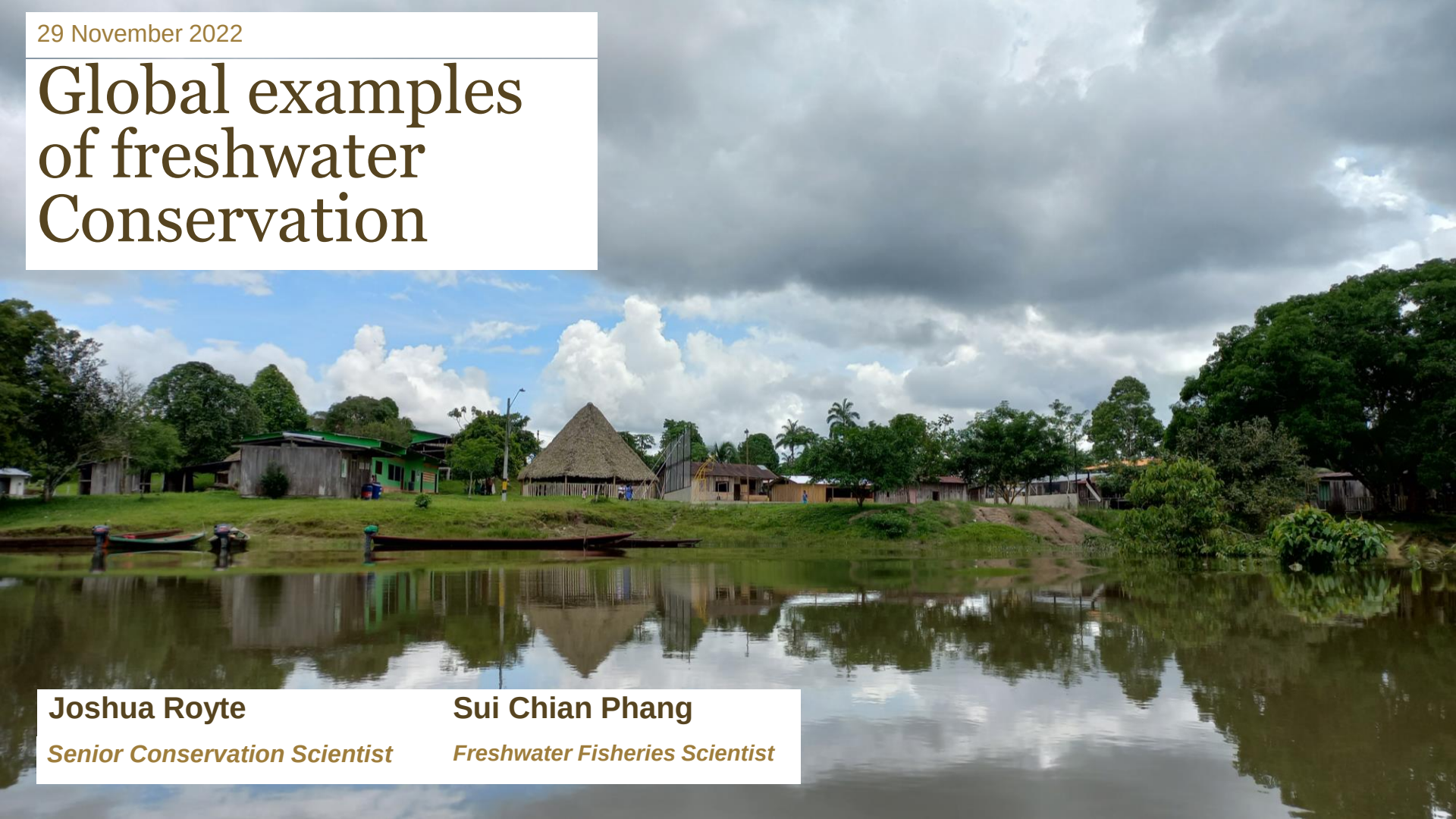
29 November 2022

Global examples of freshwater Conservation



Joshua Royte
Senior Conservation Scientist

Sui Chian Phang
Freshwater Fisheries Scientist

Overview

- Rivers host globally significant and threatened biodiversity.
- Addressing the variety of threats equally diverse and context-specific conservation activities.

Presentation structure

1. The critical importance of rivers
2. Case studies from different continents
3. Moving forward for freshwater conservation

Rivers underpin important services

Livelihood

Food

Water

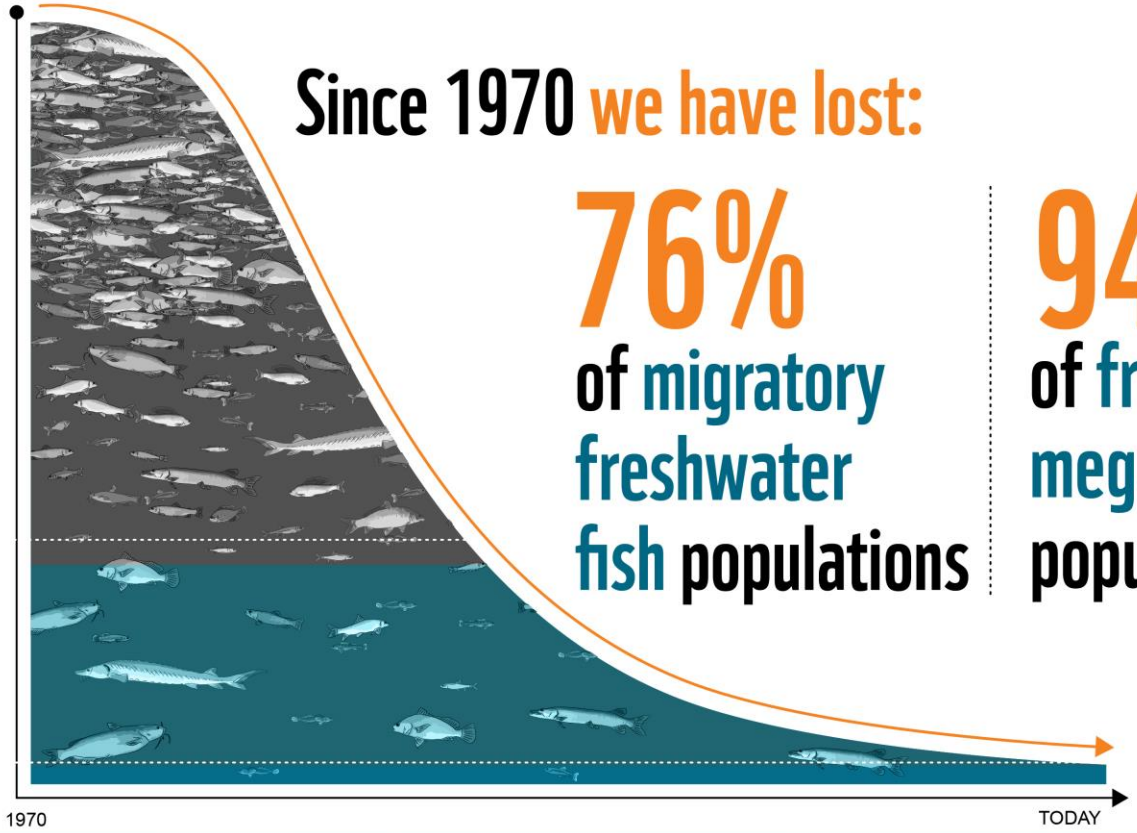
Climate Change

Biodiversity

WWF

The Nature Conservancy Maine

WORLD FISH MIGRATION FOUNDATION



Since 1970 we have lost:

76% of migratory freshwater fish populations

94% of freshwater megafish populations

THE GOOD NEWS IS THAT WE KNOW WHAT NEEDS TO BE DONE

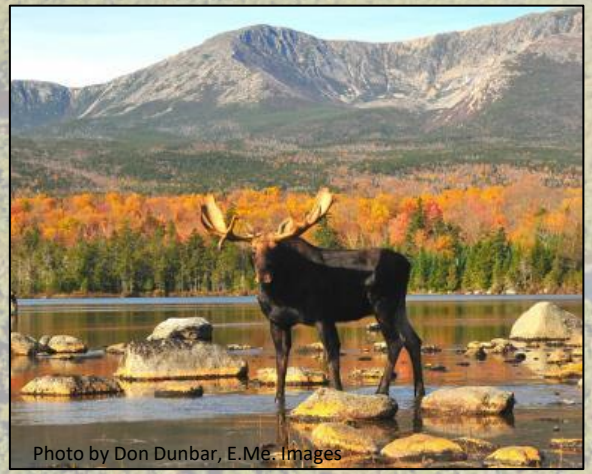


Photo by Don Dunbar, E.Me. Images


© Bridget Besaw

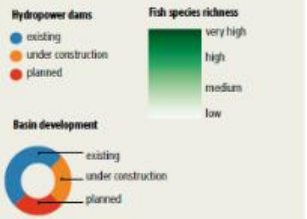
© Josh Royte/TNC

© David Hills

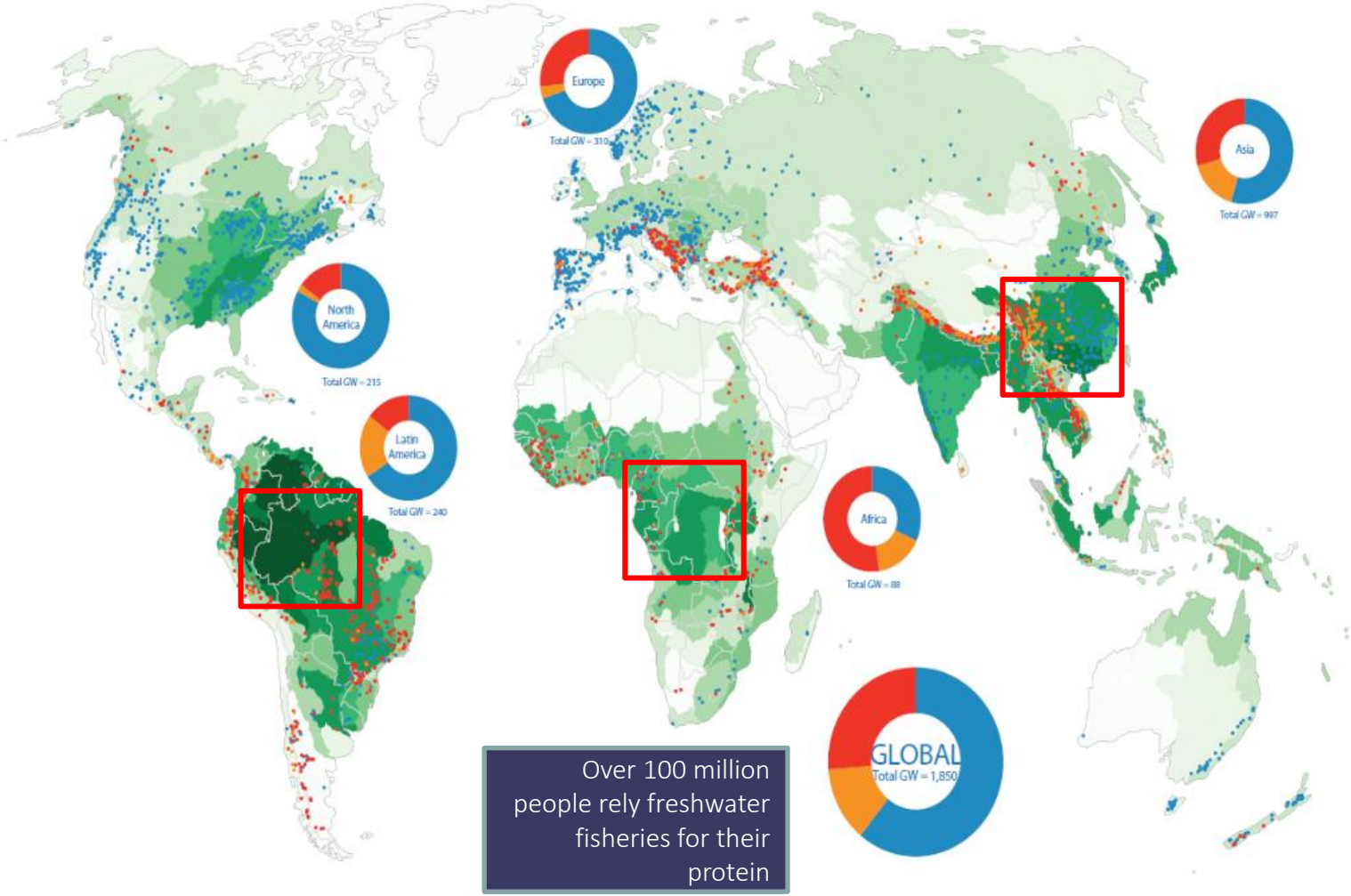

© David McLain

Global Context

Dams under construction (orange dots) and planned dams (red dots) occur in many of the river basins with the greatest freshwater species richness (dark green indicates high richness of fish species). River basins projected to undergo major expansion of hydropower include the Mekong, Nile and Amazon.



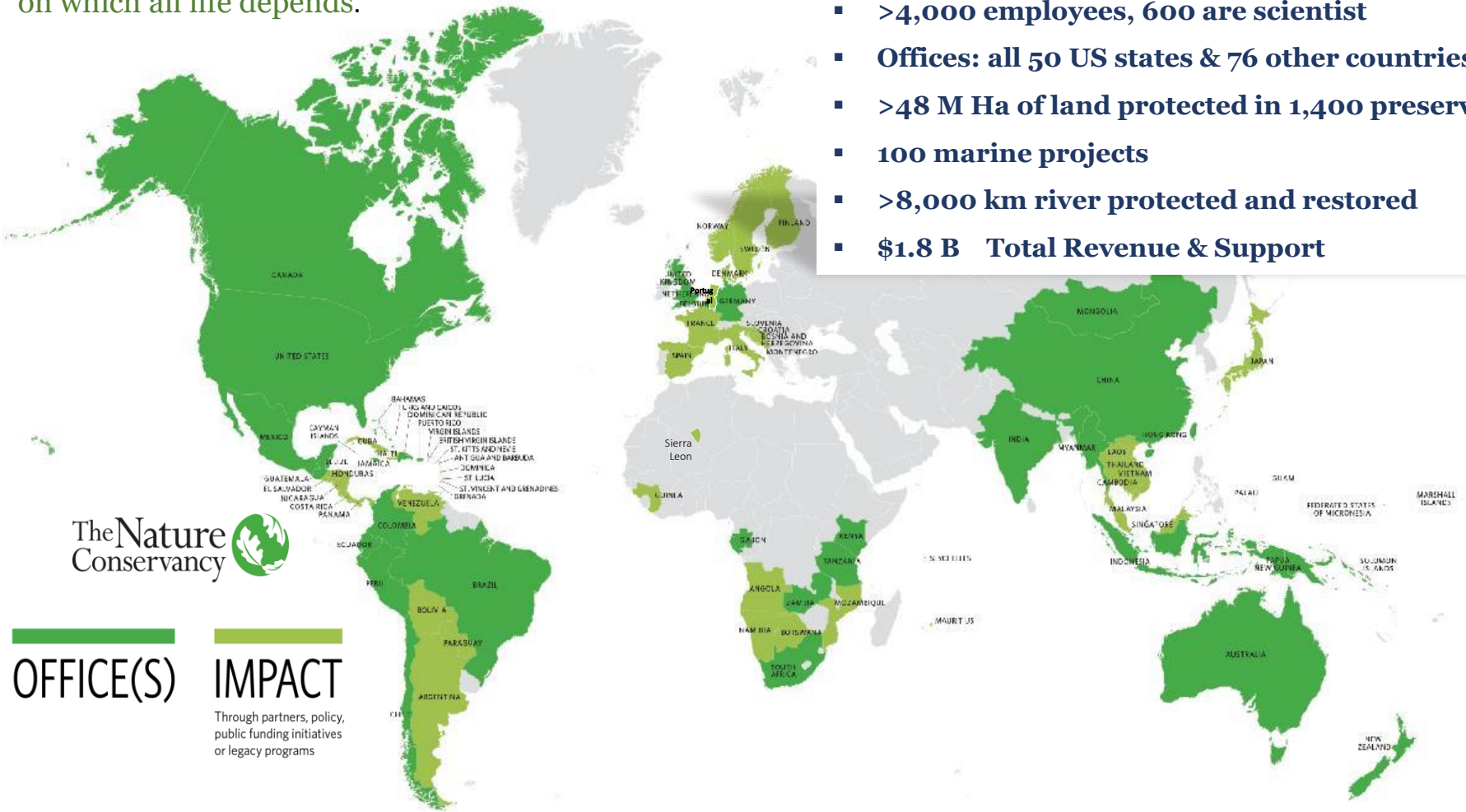
a. Fish species richness from Freshwater Ecoregions of the World (Abell et al. 2008).
b. Distribution of existing hydropower dams from Global Reservoirs and Dams (GRanD) database (Lehner et al. 2011).
c. Distribution of under construction and planned hydropower dams (capacity > 25 MW) from Zarfl et al., (2015).
d. For capacity values of continents: existing capacity from International Hydropower Association, under construction from Zarfl (2015), and planned is derived from the 2050 "2 degree" scenario of the International Energy Agency (2012). Asia includes Australia, New Zealand and Oceania.
e. For capacity values of basins: under construction and planned are from Zarfl (2015), existing data collected from various sources.



Over 100 million people rely freshwater fisheries for their protein

Mission: to conserve the lands and waters on which all life depends.

- **>1 M supporting members/foundations**
- **>4,000 employees, 600 are scientist**
- **Offices: all 50 US states & 76 other countries**
- **>48 M Ha of land protected in 1,400 preserves**
- **100 marine projects**
- **>8,000 km river protected and restored**
- **$1.8 B Total Revenue & Support**



The Nature Conservancy

OFFICE(S)

IMPACT

Through partners, policy, public funding initiatives or legacy programs

Multi-faceted Activities

Needed to restore rivers

- Barriers & habitat data
- Policies/rules for repair and new crossing
- Analysis tools to focus work
- Outreach/Education
  - Engineers, managers, advocates
  - Inspire, Educate, Enable
- Funding Mechanisms
- Implement/Monitor

WORLD FISH MIGRATION FOUNDATION

WORLD FISH MIGRATION DAY

Outreach and impact numbers

2014 - 2020

120 Million+
Engaged through Events, Media Outlets and Social Platforms

1,500 events

100
countries

4,000
organizations involved

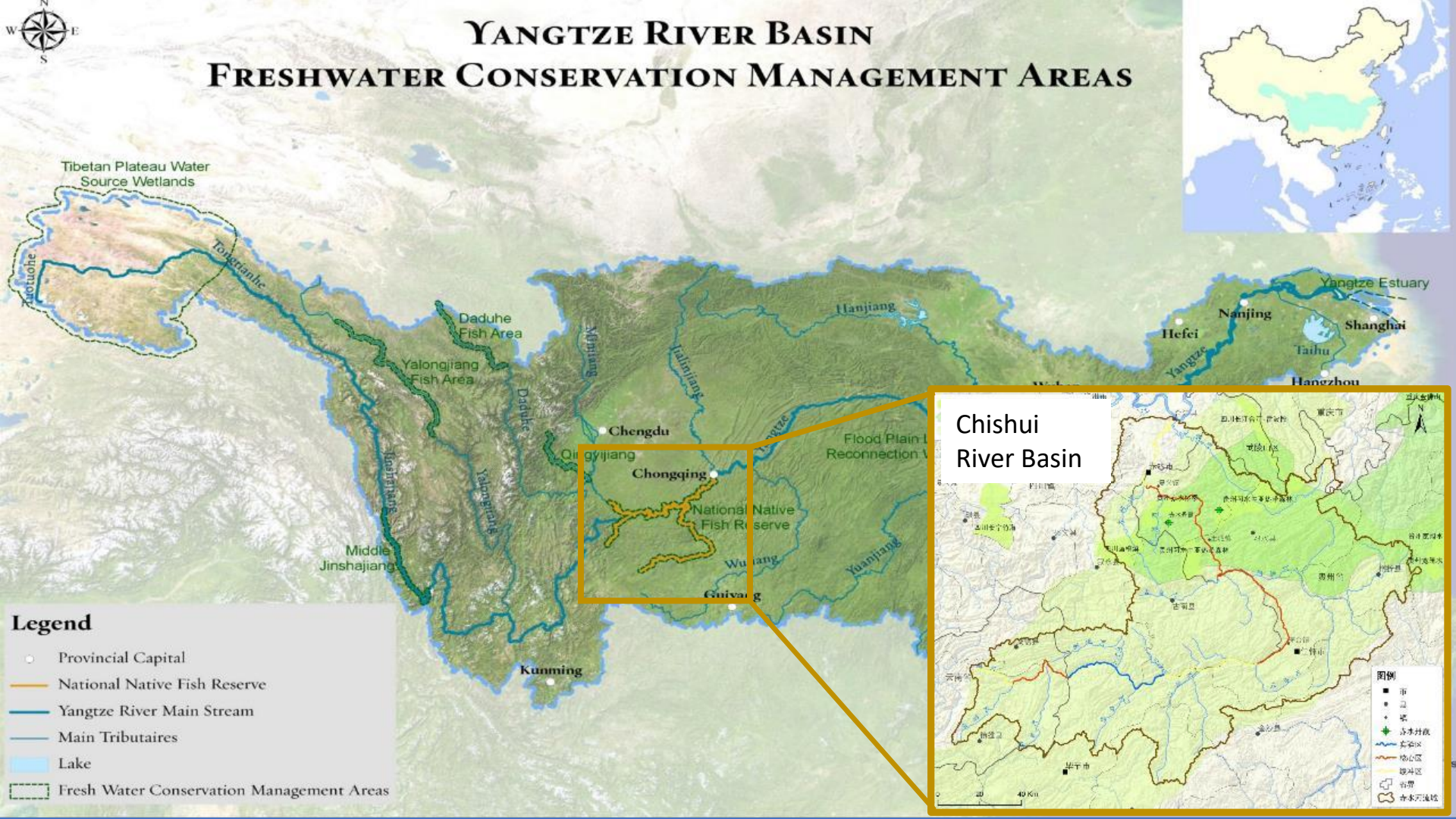
100,000
WFMD event attendees

10,000 +
Connected individuals

Upper Yangtze China

Barrier Planning, Removal & Flow Management

Yangtze River Basin
Freshwater Conservation Management Areas



Upper Yangtze & Chishui Rivers Rare & Endemic Fish Reserve

Overall species composition is similar to Yangtze

>1/3 of Yangtze's endemic fish also occur in the Chishui

Chishui River

- Major tributary of the upper Yangtze
- 437 km long and 21,000 km^2 basin
- Last undammed mainstem tributary of the upper Yangtze River
- Existing fish Preserves and Protected areas in Chishui

Policy
Supportive Trends

2016: Xi Jinping proposed "**The great protection of the Yangtze River**" → ecological protection became a **National Strategy**

2018: **Study and Work Plan**

Remediation of environmental impacts from "disorderly development of small hydropower" in the Yangtze

2019: Water and Energy Agencies issue

"Action Plan for the protection & restoration of the Yangtze"

2021: **The Yangtze River Protection Law** adopted

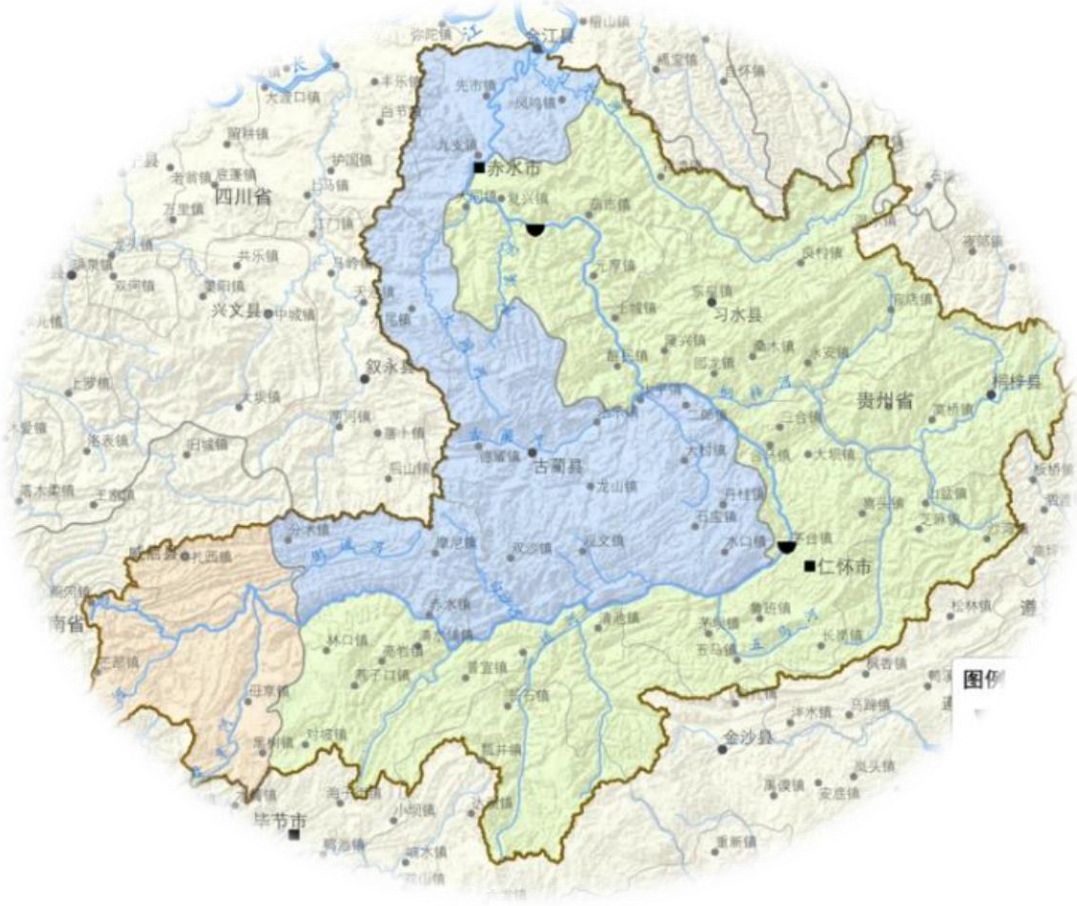
Barrier and Habitat Data

Chishui River Health Assessment

- Overall water quality is good.
- Aquatic habitat diversity is high
- Rare & endemic fish populations good

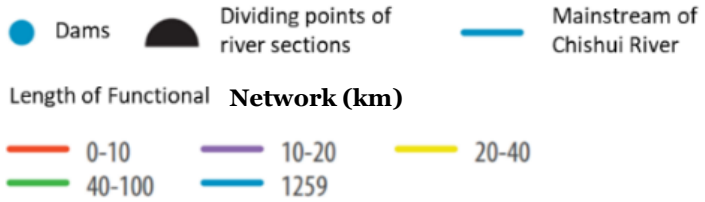
Stressors

- Middle & lower mainstream flow-alteration from tributary abstraction & hydropower.
- Fishing pressure
- Agricultural inputs
- Shipping



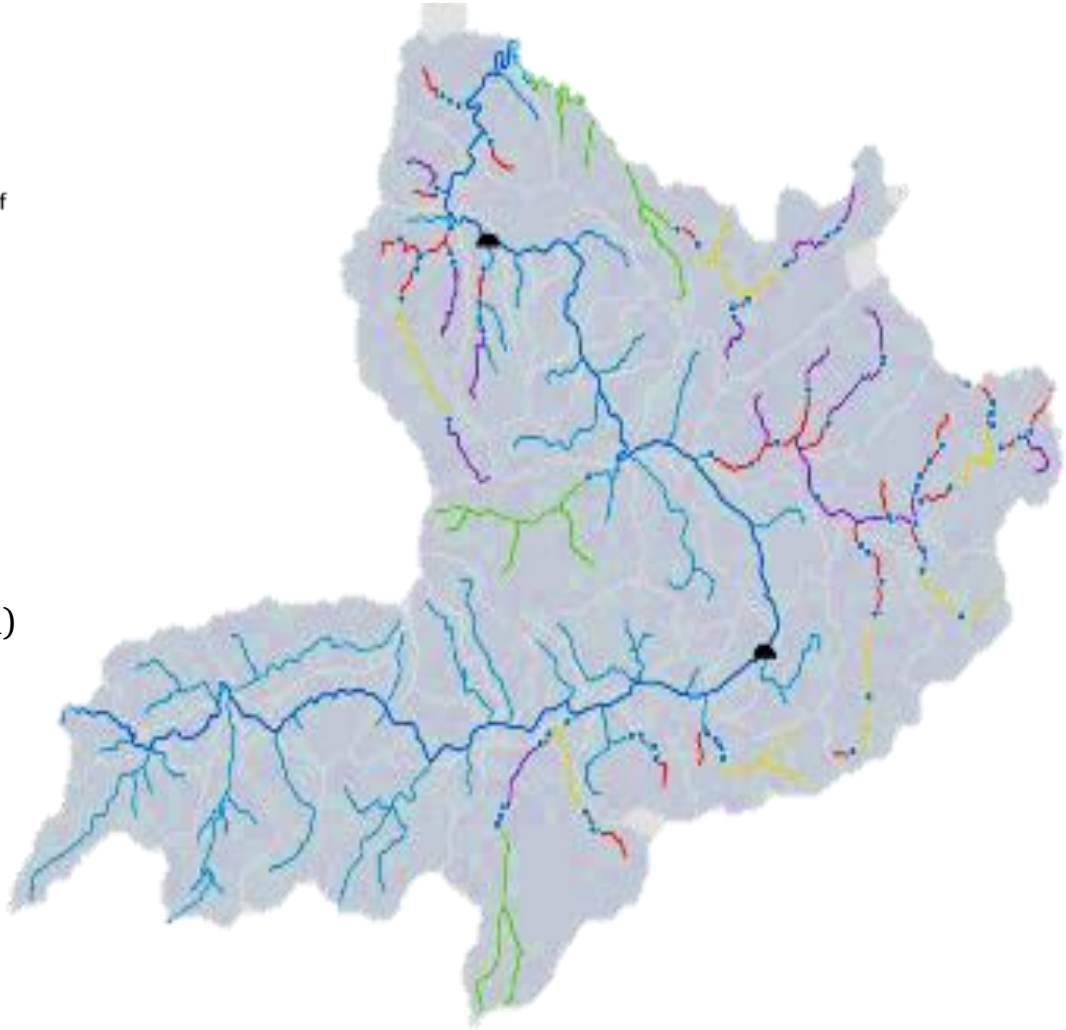
Barrier & Habitat Data

River network and habitat analysis

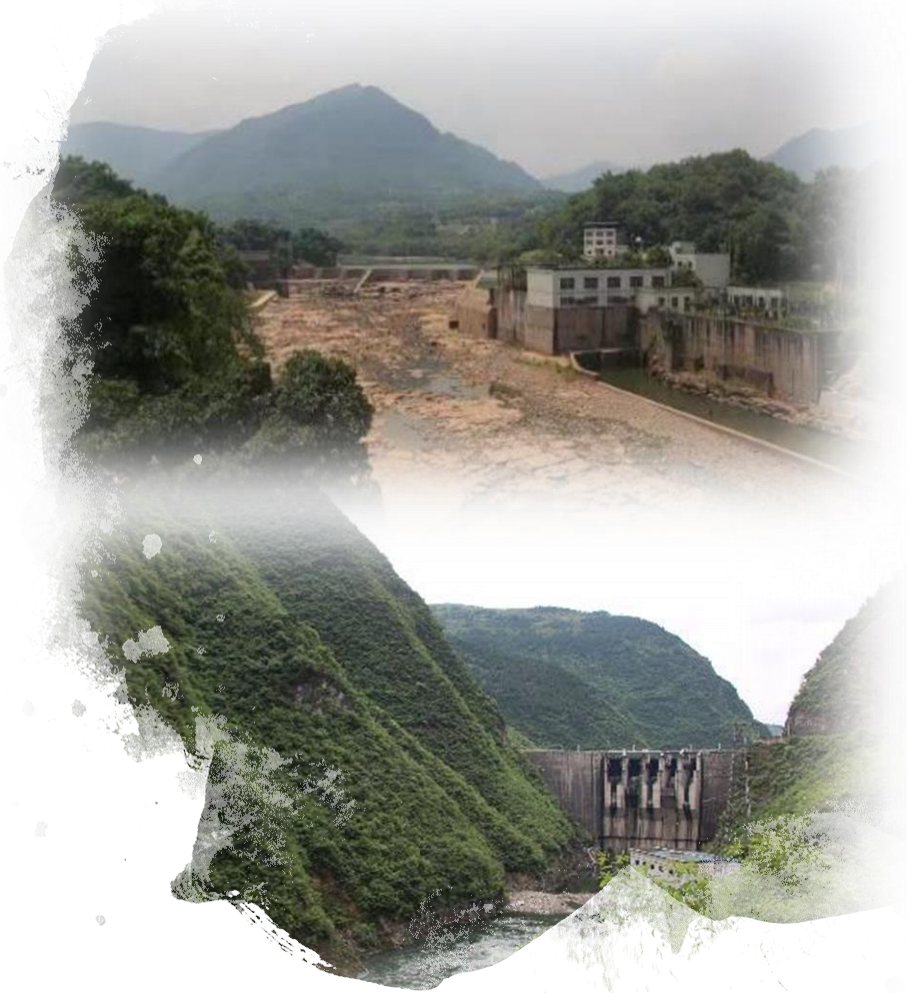


Results for connectivity analysis

- Intact mainstem (no hydropower *there*)
- 58% of basin is very well connected(1,259 km)
- Middle to lower tributaries have 300+ small hydropower dams in tributaries



Implementation
Planning & Barrier removals



Plan for 3,500 removals in the upper Yangtze

TNC help with establishing *ecological* priorities

1,100 of these already in nature reserve ‘critical’ or buffer zones

Immediate focus on removals in the Chishui basin

200 small hydropower dam & other barriers in Guizhou, Sichuan & Yunnan Provinces

Implementation
Chishui Barrier removals

The demolition of powerhouse in Sichuan

Yunnan-Chishui River Section
17 small hydropower dams
Removed by 2020!
Site restoration plans needed & are in development

Sichuan-Chishui River Section ~30 small hydropower dams

Guizhou-Chishui River Section
~100 small hydropower dams

These are to be removed over the coming 3 years and are advancing quickly with sound environmental supervision

Challenges

Lessons to Learn/Share

- Local concern (# and speed of removals)
- Blasting waste removal/disposal
- No guidelines on the official websites
  - Planning/prioritization
  - Barrier removal
  - Site restoration
  - Monitoring
- Coordination among regional and national agencies/department.

Maine, USA

Penobscot River, Large and Small Barriers, Policy, Measures

Penobscot basin = 22k,000 km²

Maine's largest River Basin

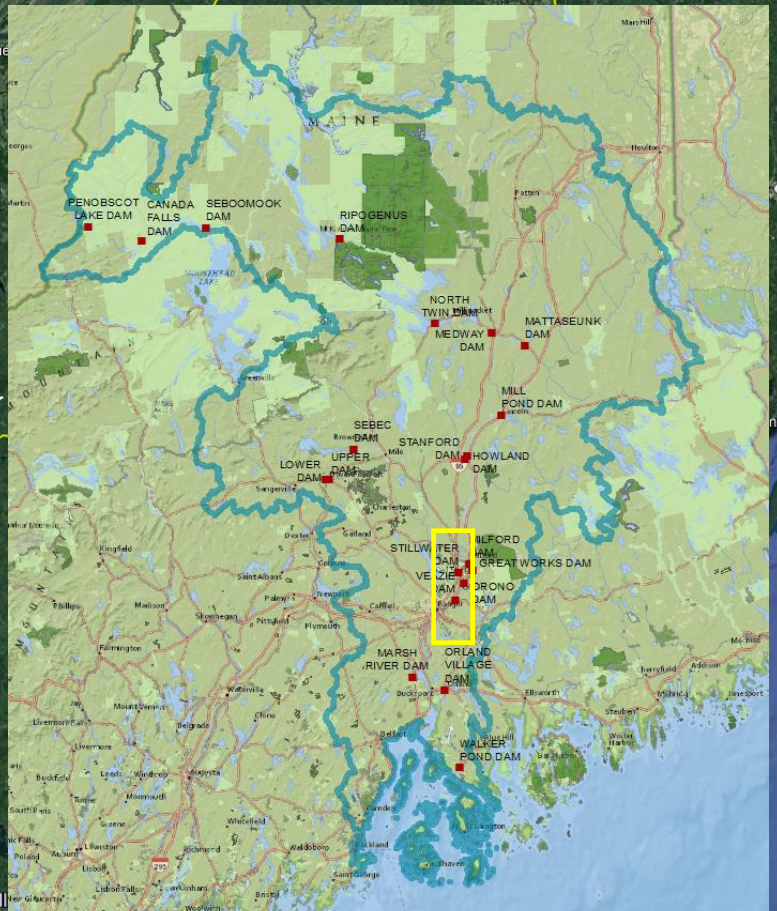
85% Forested

Key source of freshwater &..

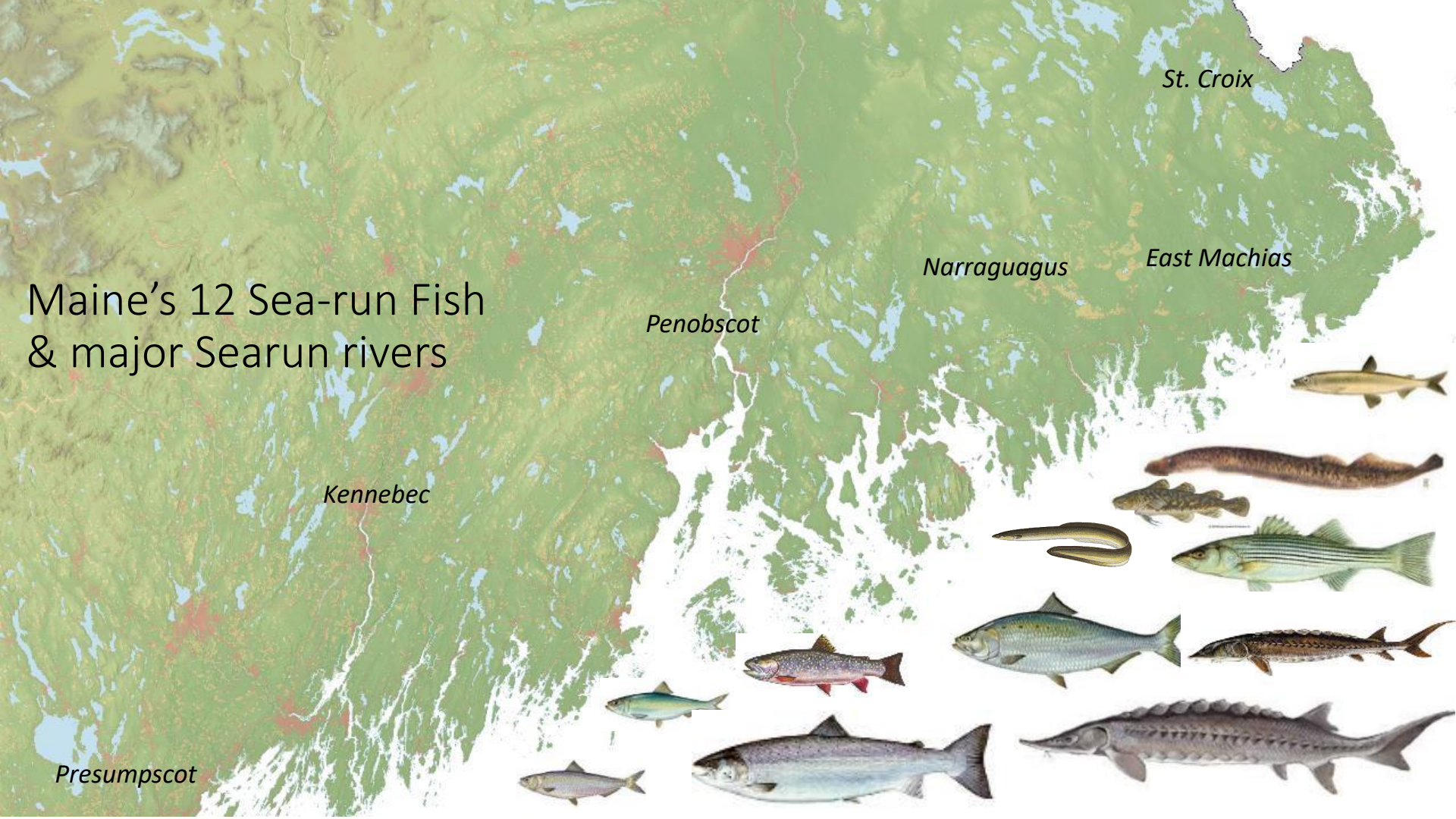
Forage fish for Gulf of Maine fishery

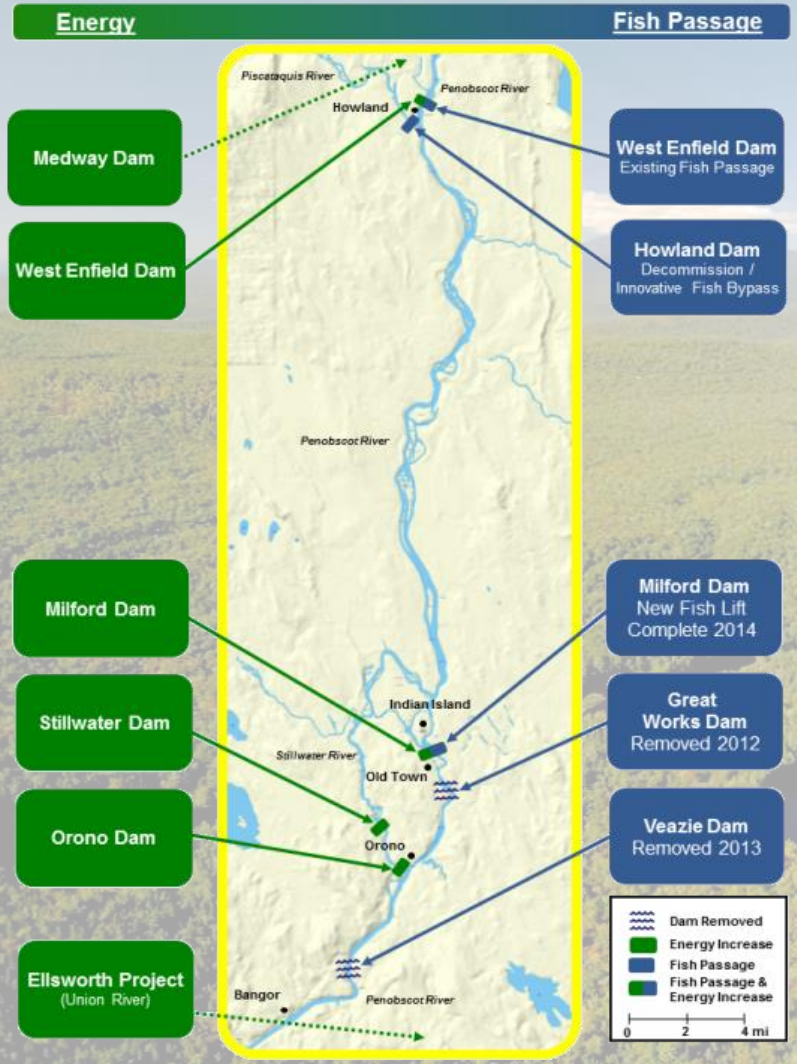
20,117 Km of streams

1830-2013: just 4% accessible



Maine's 12 Sea-run Fish & major Searun rivers





Penobscot River Restoration Project

→ Removal of Two Mainstem Dams
closest to sea: Veazie & Great Works

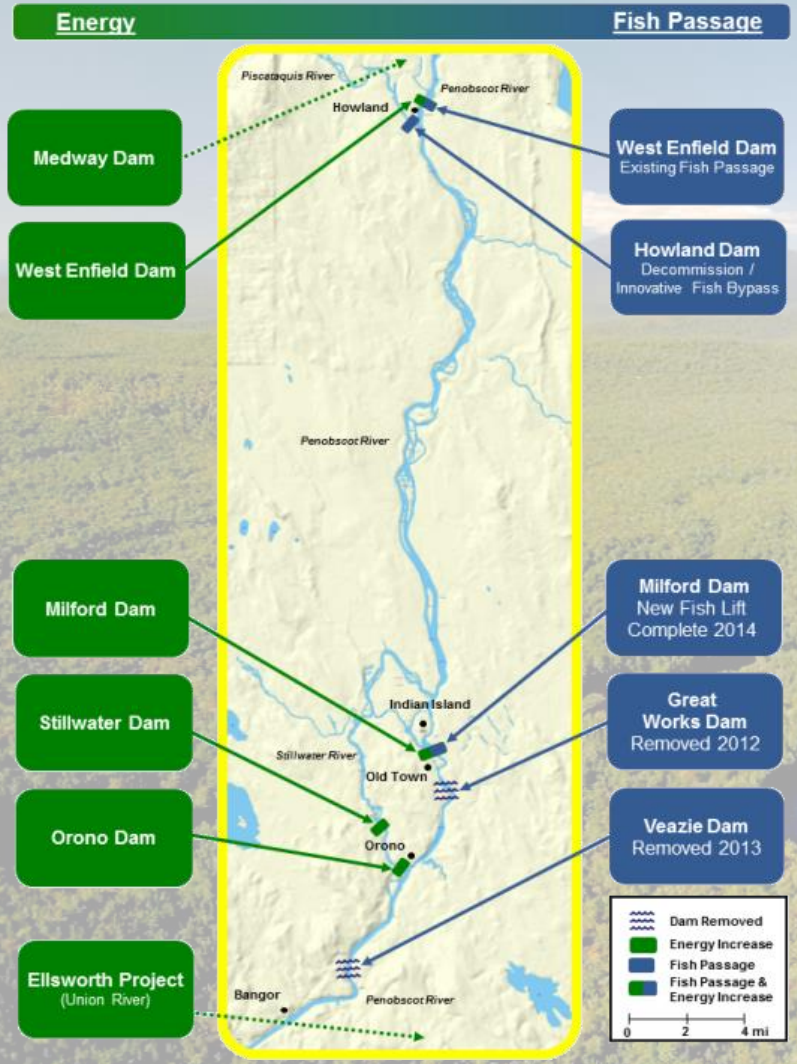
→ Bypass Howland Dam
for inland habitat access

→ Fish passage & Treatise Rights

→ Overall Increased Energy

→ Enhanced Habitat Access
3,200 km of historic habitat

→ *Help* Restore:
12 species of native sea-run fish, associated traditions, culture, and economic opportunities



Social Enabling Conditions

→ Federal Tribal Recognition

→ Federal Dams/Powers Act

→ Pending & final ESA Salmon listing

→ Partner capacity/timing

→ Bruising defeat of proposed dam

→ Inspired Power Company

→ Power of Relationships for *(lots of)* Negotiations

Great Works Dam

1830's - 2012

Great Works Dam Removal June 2012

Laura Rose Day Ken Salazar Butch Phillips Pat Kelliher


Great Works Dam Removal June 2012


Great Works Dam Removal June 2012

Howland Fish Bypass

1910's - 2016

No Dam Removal ☹

But successful Nature-like Fish Bypass

Energy Outcome/Balance

Local System vs Grid renewable capacity

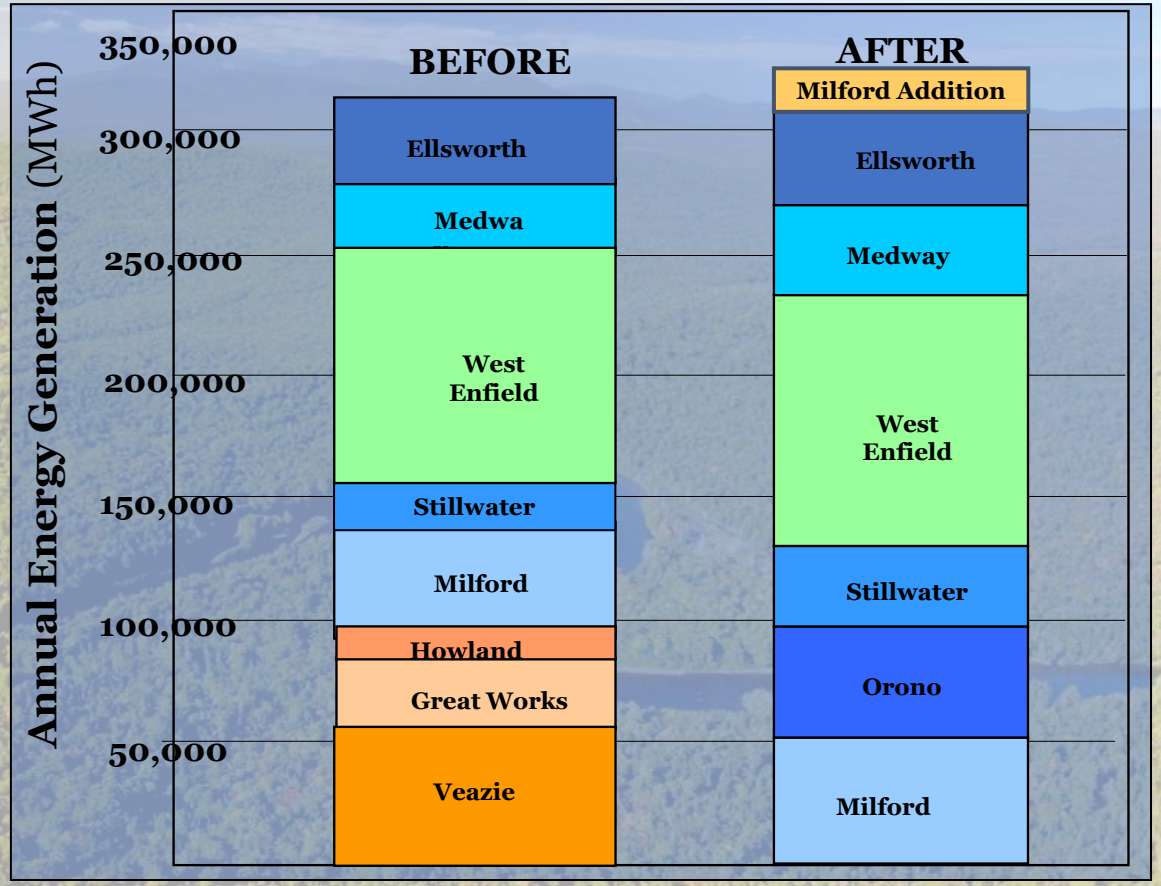
Built Capacity

VZ: 8.5 MW

GW: 7.7 MW

HL: 1.9 MW

18.1 MW



Ecological Response

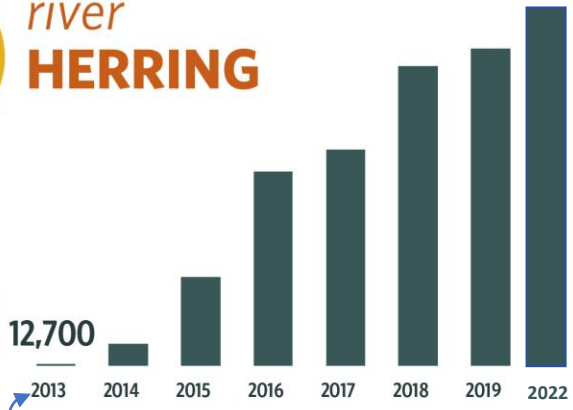
searun **FISH**

river **HERRING**

birds

marine

native **FISH**



Economic Response

river herring
HARVESTS

$71,988

Town revenue quadruples over a 10 year period.

resource
AVAILABILITY

lobster
INDUSTRY

food
RELIEF

increased
GROUNDFISH

Social Response

restoring treatise
FISHING RIGHTS

healthier
FOOD SOURCE

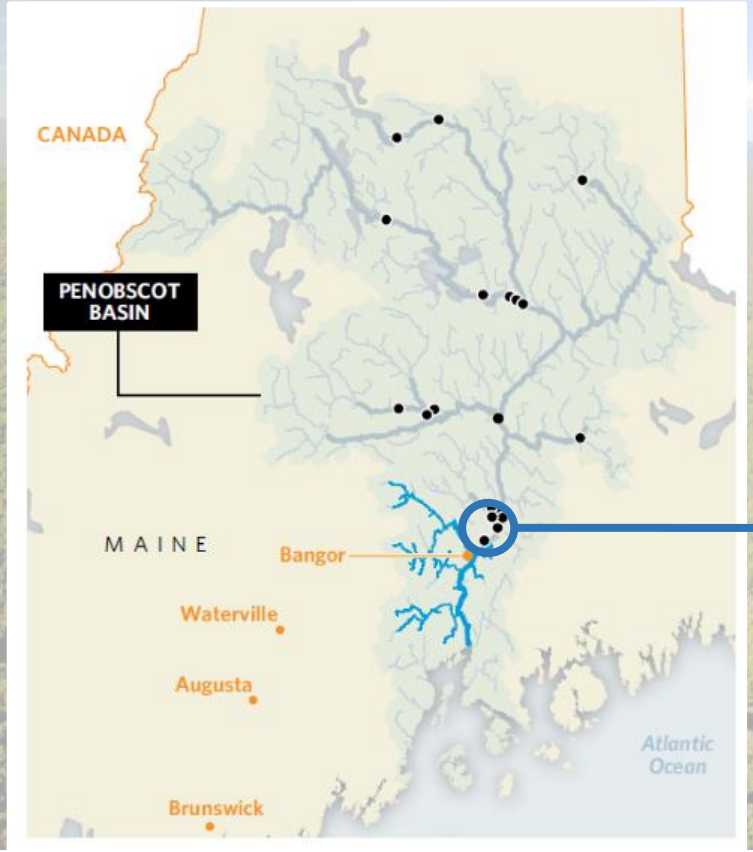
boating

fishing
INCREASE

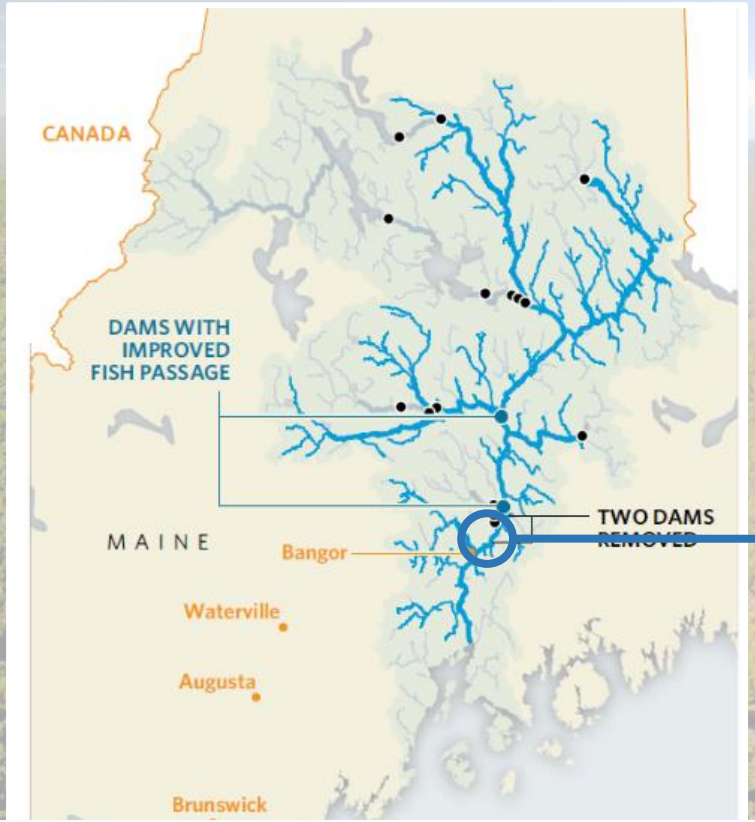
community
CONNECTIONS

Penobscot River Restoration Begins, June 2012

Largest remaining run of Atlantic salmon in the US



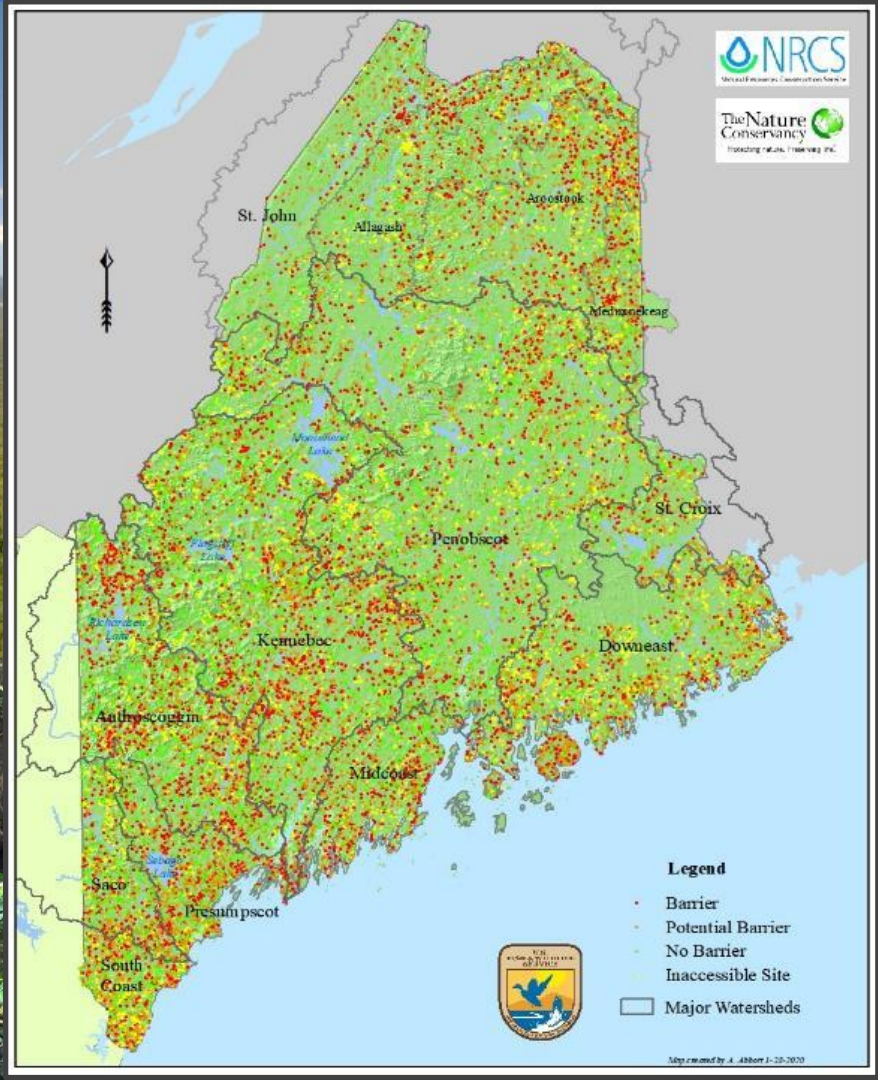
A More Connected Penobscot: May 2016



3,200 km of additional accessible habitat

Stream Barrier Inventory

- More than 27,000 data points
- 70,000 photographs
- 90% of Maine
- 30-50% are barriers to fish passage



Science & planning

- Statewide Inventory of barriers &
- Upgrade priority habitats mapping
- Flood risk assessment for culverts
- Online prioritization tools

Policy and Funding mechanisms

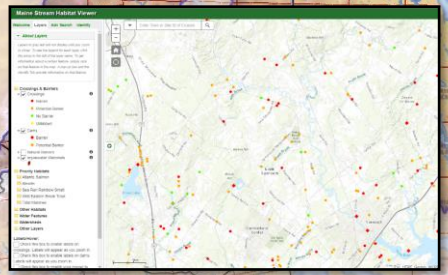
- Revised restoration permitting
- State restoration funding ($20M)
- National restoration funding ($6B)

Outreach/Education

- Statewide “Stream Smart” classes (intro + advanced for planners, surveyors, engineers, project management)
- Engineer incentive grants
- Alternative energy financing

Implementation & Monitoring

- 30+ road crossings upgraded
- 8 dam removals (3+ planned)
- 10 rock-ramps/bypass/fishways
- Fish counts, eDNA, stable isotope
- 300 adult salmon grown for *in situ* spawning



Okavango Basin


Okavango River: Angola, Namibia, Botswana
Data, Hydropower, Fishing Regulation
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image Landsat / Copernicus
Google Earth

Okavango Basin

- Angola, Namibia and Botswana
- Annual floods
- 171,000 km^2
- Important habitat for terrestrial biodiversity
- Relatively low aquatic productivity globally but regionally important

Challenges

- Recent civil war
- Remote region with little infrastructure and investment
- Proposed hydropower
- Deforestation
- Uncertain tenure and rights
- Fishing pressure and few livelihood options

Conservation actions

- Partner with communities to organize fishery co-operatives to manage freshwater
- Setup multi-stakeholder commissions to elevate community interests in decision-making
- Design sustainable fishery management activities and training of co-operative members
- Improving livelihood (fishery and non-fishery)

Amazon River

Amazon River: Columbia

Data, Hydropower, Sustenance Fishing

Caquetá River, Colombia

- Colombia and Brazil
- Annual floods
- 2,280 km long, 250,000 km² (river basin)
- 78*% of the Colombian Amazon
- Indigenous territories cover 43% of the basin's surface area

Challenges

- Fossil fuel extraction
- Gold and aggregate mining
- Agriculture and cattle ranching
- Climate change
- Aquaculture
- Unsustainable fishing

Conservation actions

- Freshwater conservation and management of protected areas
- Partnering with and elevating IPLC tenure and rights through training and within development decisions
- Community-based livelihoods like sustainable fisheries, tourism and forestry systems in line with community vision of development

Summary

- Mapping key habitats and threats to biodiversity informs actions for nature and related services for people
- Globally freshwaters face a variety but often common and co-occurring threats
- Appropriate conservation pathways must be socially, culturally and politically aware
- Multi-stakeholder approaches are necessary, inclusive of local communities, academics, governments, and private sector
- Local communities are often most impacted and have important roles as stewards, to inspire change we need better modes of communication, co-learning, and assistance

Josh Royte (jroyte@tnc.org) | Sui Phang (sui.phang@tnc.org)