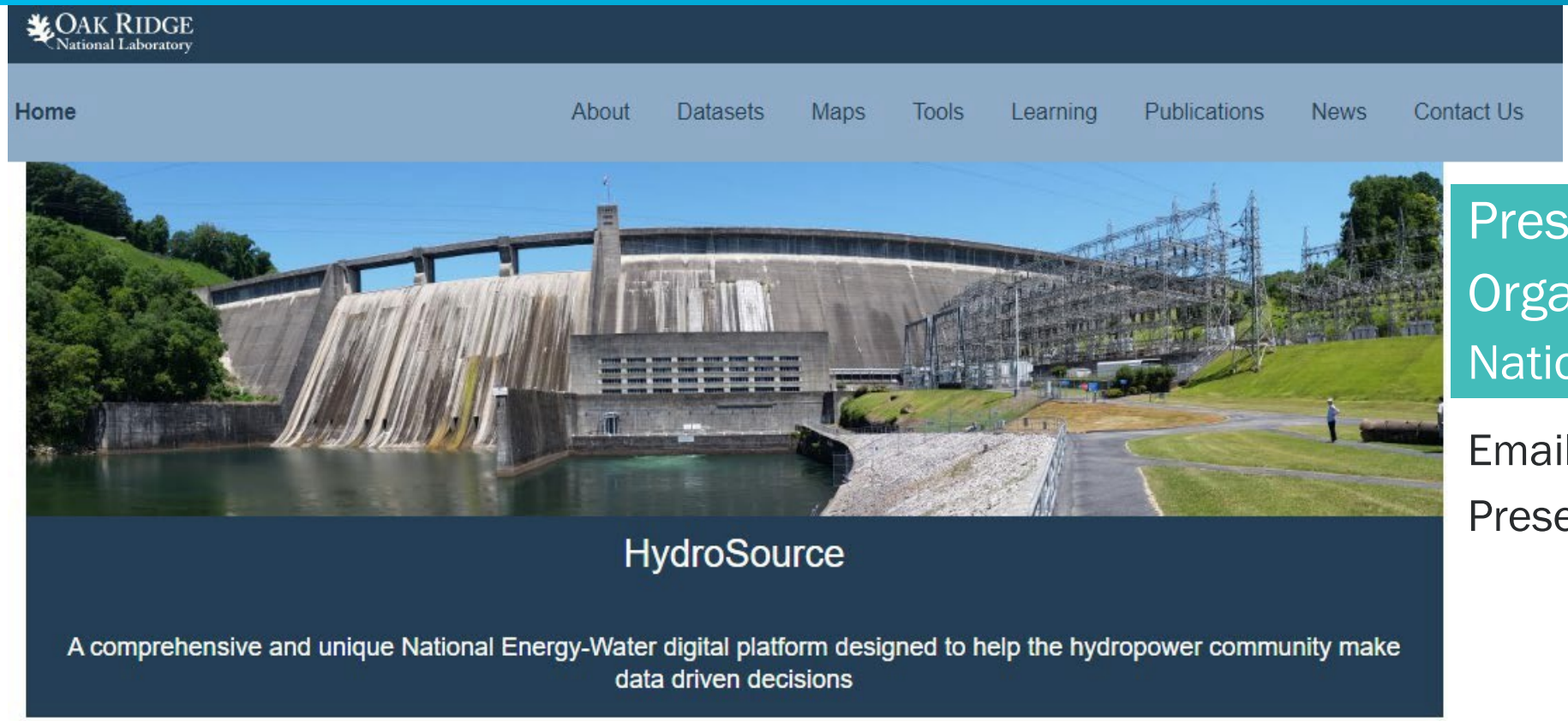
1.5.1.502 – HydroSource



Presenter: Debjani Singh
Organization: Oak Ridge National Laboratory

Email: debd@ornl.gov

Presentation Date: 07/27/2022

Project Overview

Project Summary

- HydroSource is the most comprehensive and unique National Energy-Water digital platform designed to help hydropower stakeholders make data-driven decisions with diverse datasets.
- Addresses lack of access to information necessary to support hydropower related decision-making.
- Uses data science and data analytics to develop data collections and tools to effectively assemble, consolidate, and compare diverse datasets from a range of sources across the hydropower spectrum

Intended Outcomes

- HydroSource provides streamlined access to authoritative information about U.S. hydropower assets and hydropower development potential to serve the data needs of a diverse user-base
  - facilitate interdisciplinary investigations
  - use of new analytical capabilities and tools to weigh multi-objective tradeoffs and support stakeholder decision-making at basin scales
  - play a critical role in 'water-data' landscape

Project Information

Principal Investigator(s)

- Debjani Singh

Project Partners/Subs

- Internet of Water
- Hydro Research Institute (HRI)
- Kearns & West

Project Status

Ongoing

Project Duration

- Project Start Date: October 2010
- Project End Date: Ongoing

Total Costed (FY19–FY21)

$3.184 Million

Project Objectives: Relevance to Program Goals

Challenge: Lack of access to information to support decision-making

Programmatic Activities:

- Support the development of systems and standards to improve access to integrated water data and information relevant to hydropower stakeholders.
- Improve capabilities to analyze multifaceted types of hydropower and water data to better identify opportunities and weigh potential trade-offs at basin-scales

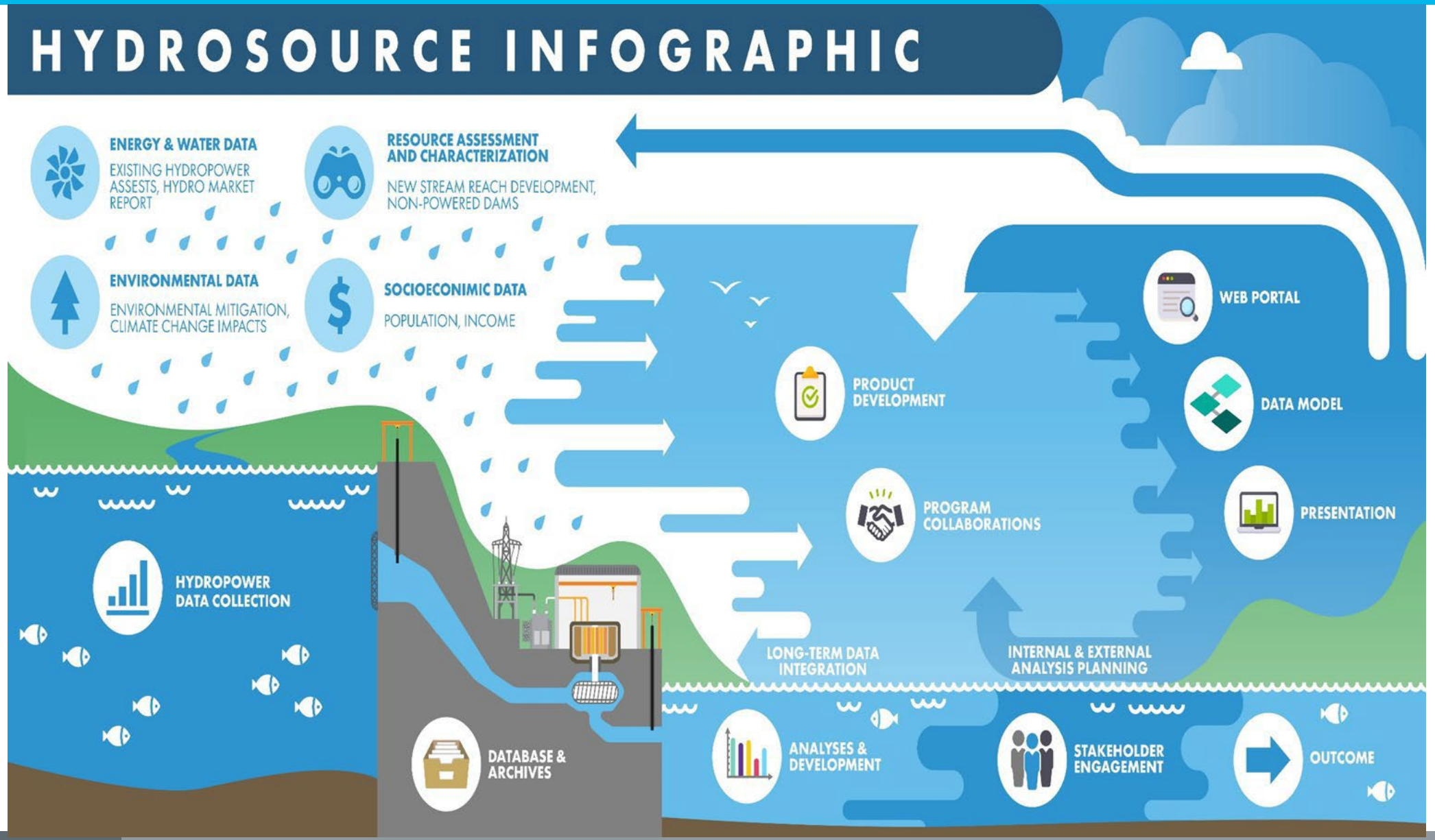
Intermediate Outcome

- Reduced cost/time and greater certainty in federal/state authorization processes for hydro development and relicensing
- Improvements in river/water data availability, accessibility, and management
- Commercialization and use of new analytical tools to weigh multi-objectives trade-offs at basin scales

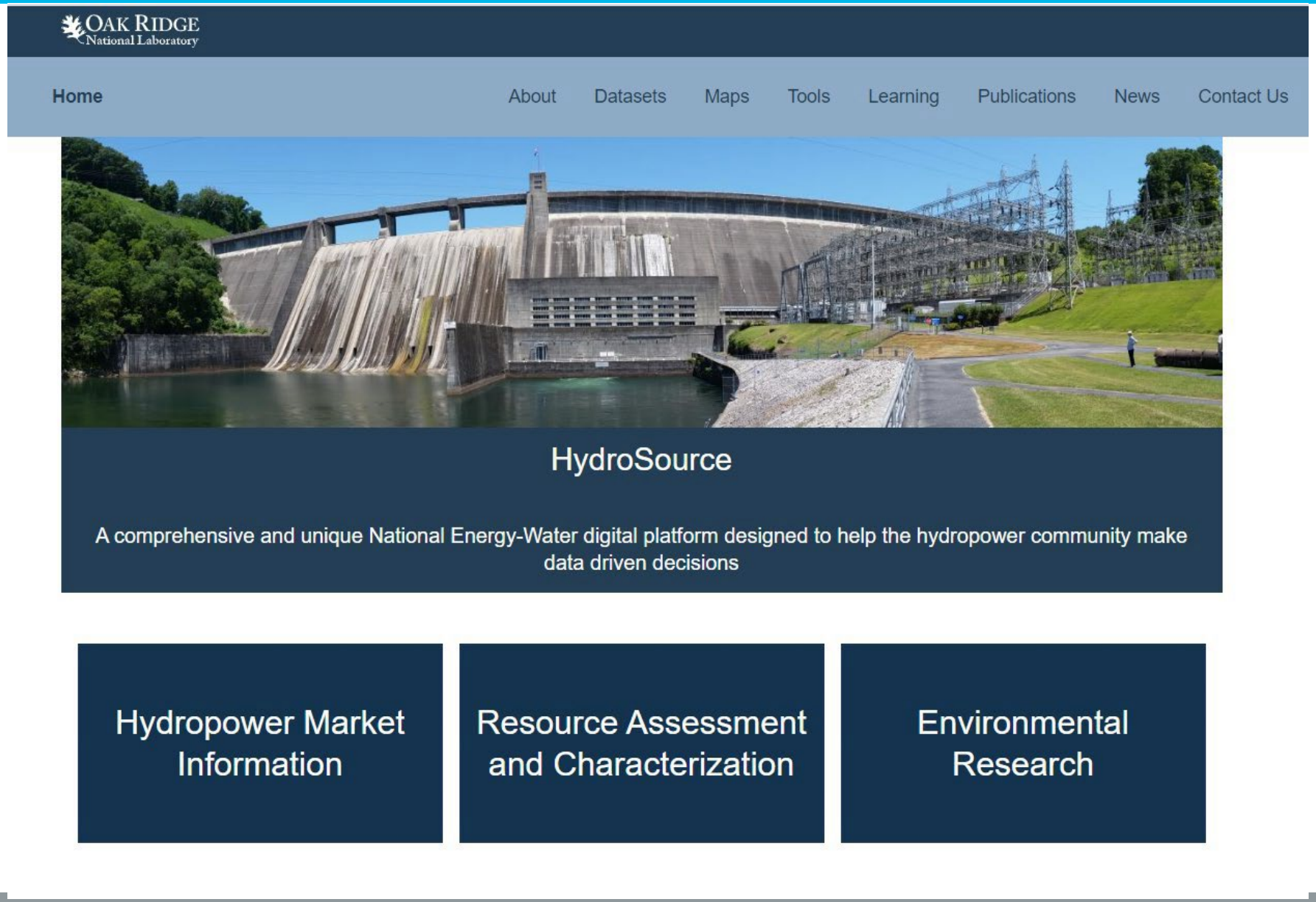
Long Term Outcome

- Knowledge diffusion for improved decision making processes and basin-wide management of river resources for multiple objectives
- Contribute to clean, renewable future energy portfolio through sustainable development of hydropower
- Energy Security

Project Objectives: Approach



Project Objectives: Approach

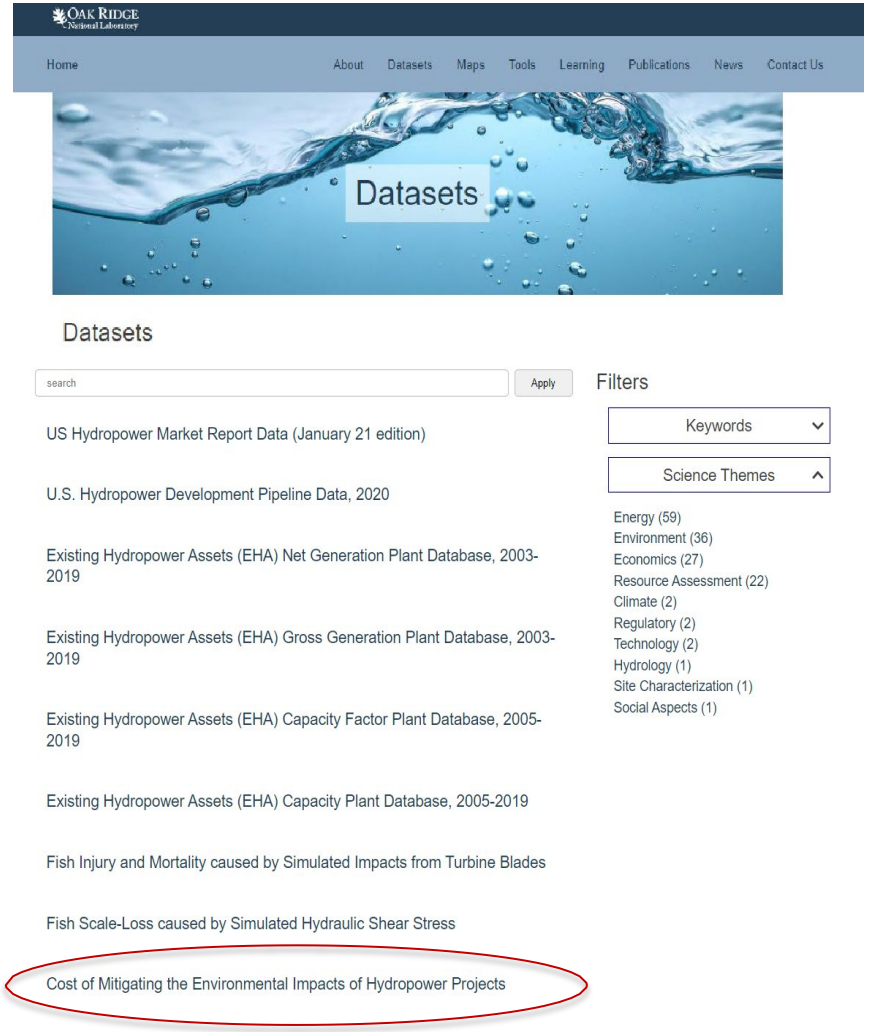


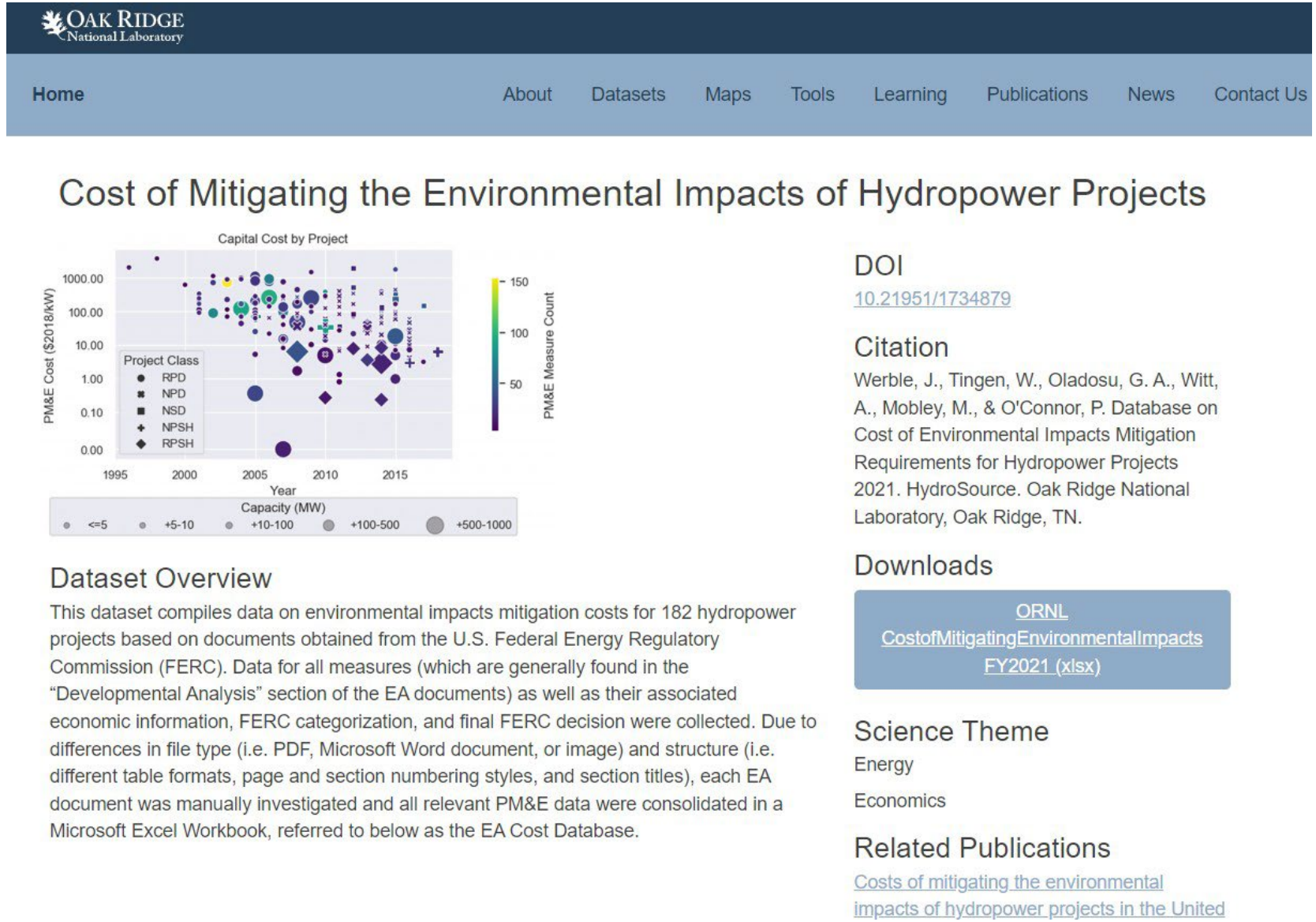
Hydropower Market Information

Resource Assessment and Characterization

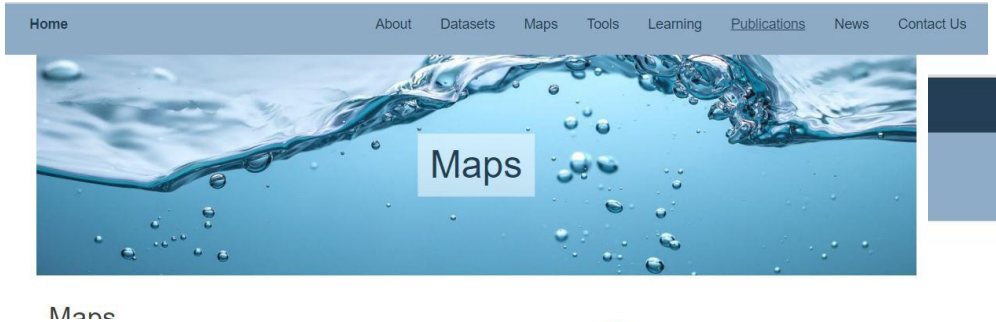
Environmental Research

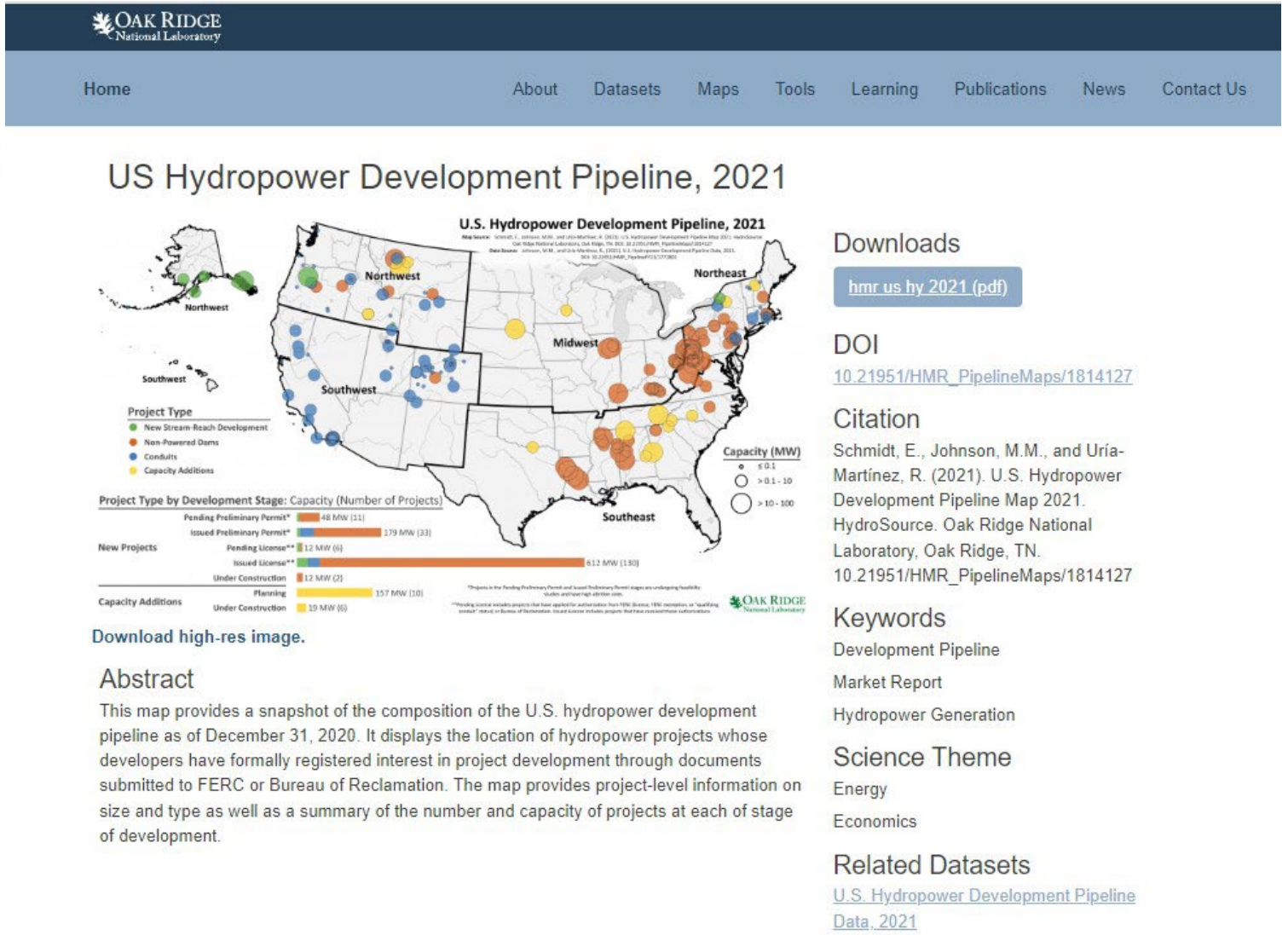
Project Objectives: Approach





Project Objectives: Approach





Project Objectives: Expected Outputs and Intended Outcomes

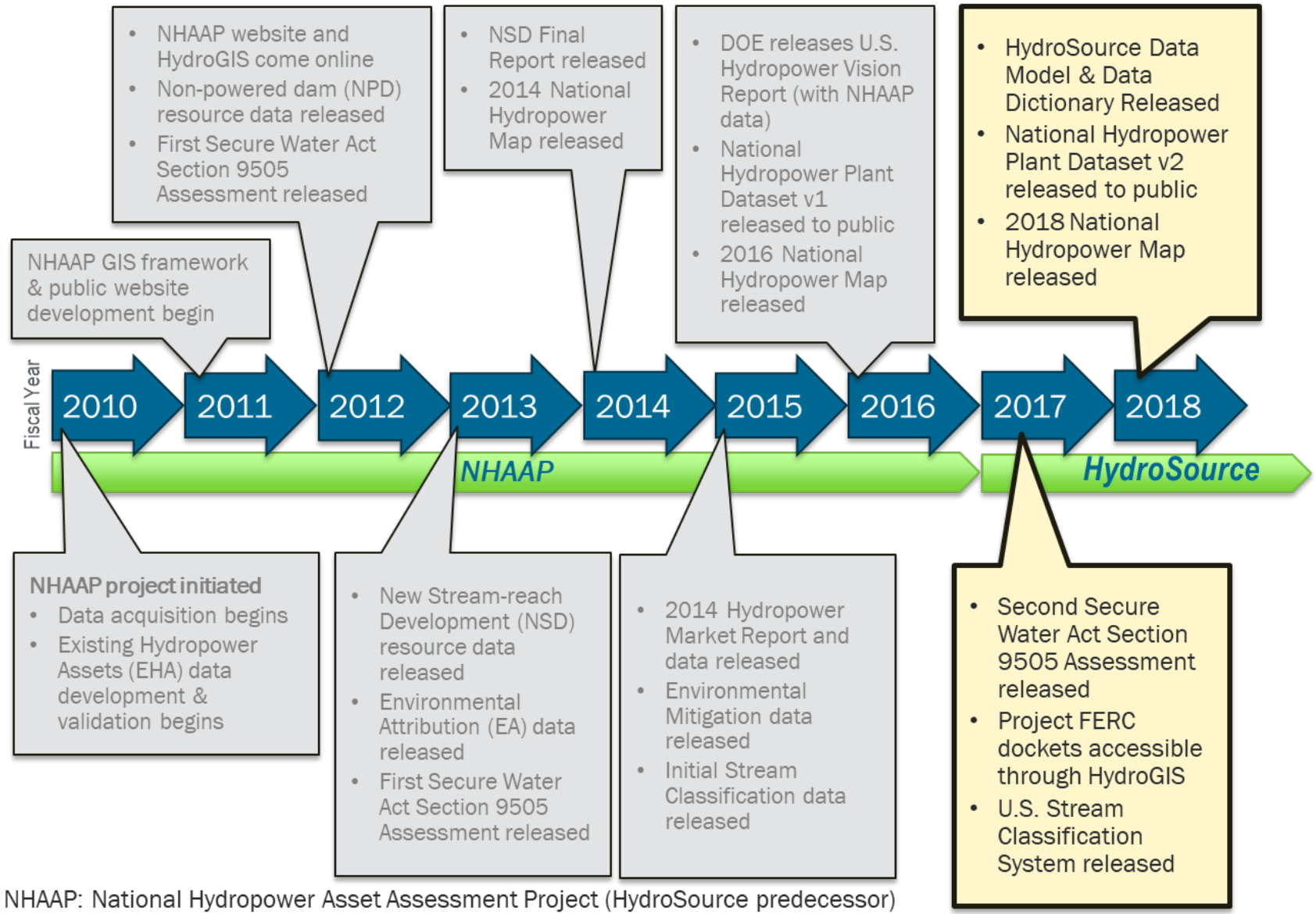
Outputs:

- A standalone data portal housing all publicly available hydropower related datasets at https://hydrosource.ornl.gov
- Multiple tools and applications with use-case capabilities that will improve the usage of the datasets (housed on HydroSource) in decision making
- A dedicated user base for hydropower data
- HydroSource as a water data hub in the Internet of Water

Outcomes:

- Enhance access to most up-to-date hydropower related information
- Efficient stewardship of science-quality data.
- Facilitate interdisciplinary investigations by providing efficient and harmonized data systems.
- Management and analysis of complex hydrology data.
- Develop and maintain partnerships to expand the use of open data, promote open science, and increase the use of data across multi-disciplinary, multi-agency organizations.
- Demonstrate leadership in Hydropower related data system technology and techniques.

Project Timeline



NHAAP: National Hydropower Asset Assessment Project (HydroSource predecessor)

Project Timeline Cont. (Peer Review Period)

FY 2019

Initial scoping of potential thematic map series

Updated Existing Hydropower Asset (EHA) dataset

Initial scoping of HydroSource website redesign

FY 2020

Redesign of HydroSource Website

Started development of HydroSource Data Explorer

Published National Hydropower Map

Published 5 new datasets and updated the EHA dataset

License agreement with Hydropower Research Institute (HRI).

Initial analysis of the impact of expanding wild and scenic rivers on Hydropower

Developed 3 thematic map series

- Relicensing
- Fish Species of Concern
- Environmental Mitigations

FY 2021

Completed development and released the HydroSource Data Explorer to the public along with its API

HydroSource Data Story published at the Basin Scale Data Access workshop

Added new functionalities to the website

Published 20 new datasets and updated EHA dataset

Collaborated with Internet of Water to establish HydroSource as a Water Data Hub

Completed analysis of the impact of expanding wild and scenic rivers with most recent hydropower infrastructure data

Project Budget

Total Project Budget – Award Information		
DOE	Cost-share	Total
$3.148 Million	None	$3.148 Million

FY19	FY20	FY21	Total Actual Costs FY19–FY21
Costed	Costed	Costed	Total Costed
$384,000	$986,000	$1,778,000	$3,148,000

End-User Engagement and Dissemination

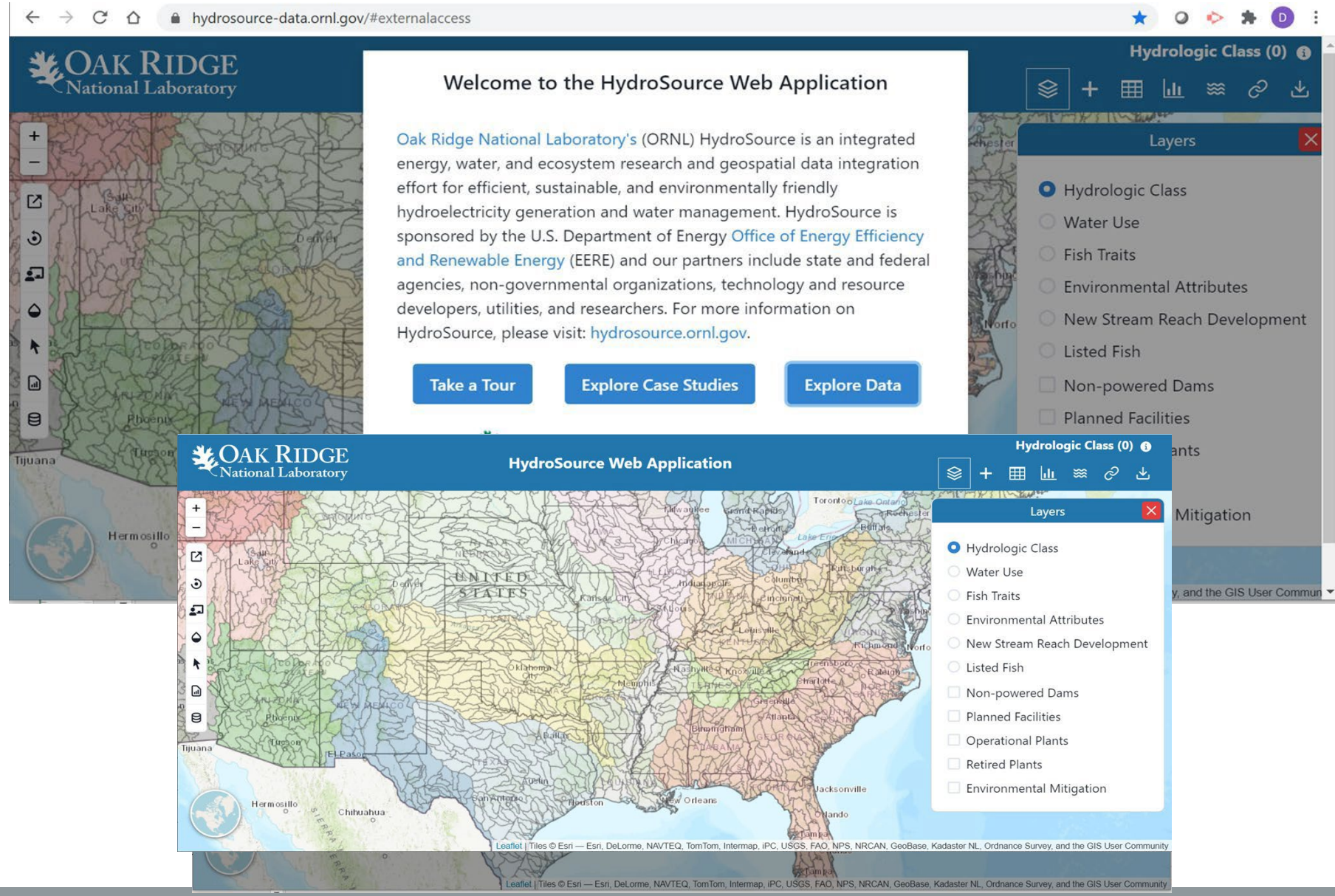
HydroSource strives to engage with end-users through

- Workshops
  - Basin scale data access workshop
- Webinars
  - Industry/commercial engagement through the NHA transparency series
  - Uncommon Dialogue working group meetings
  - Agency and institutional engagement through USFWS & USDOI sponsored "Turbine Talk"
- Web portal: https://hydrosource.ornl.gov
  - "Contact Us" form enables public to provide specific feedback on portal or data
- Conference Presentations

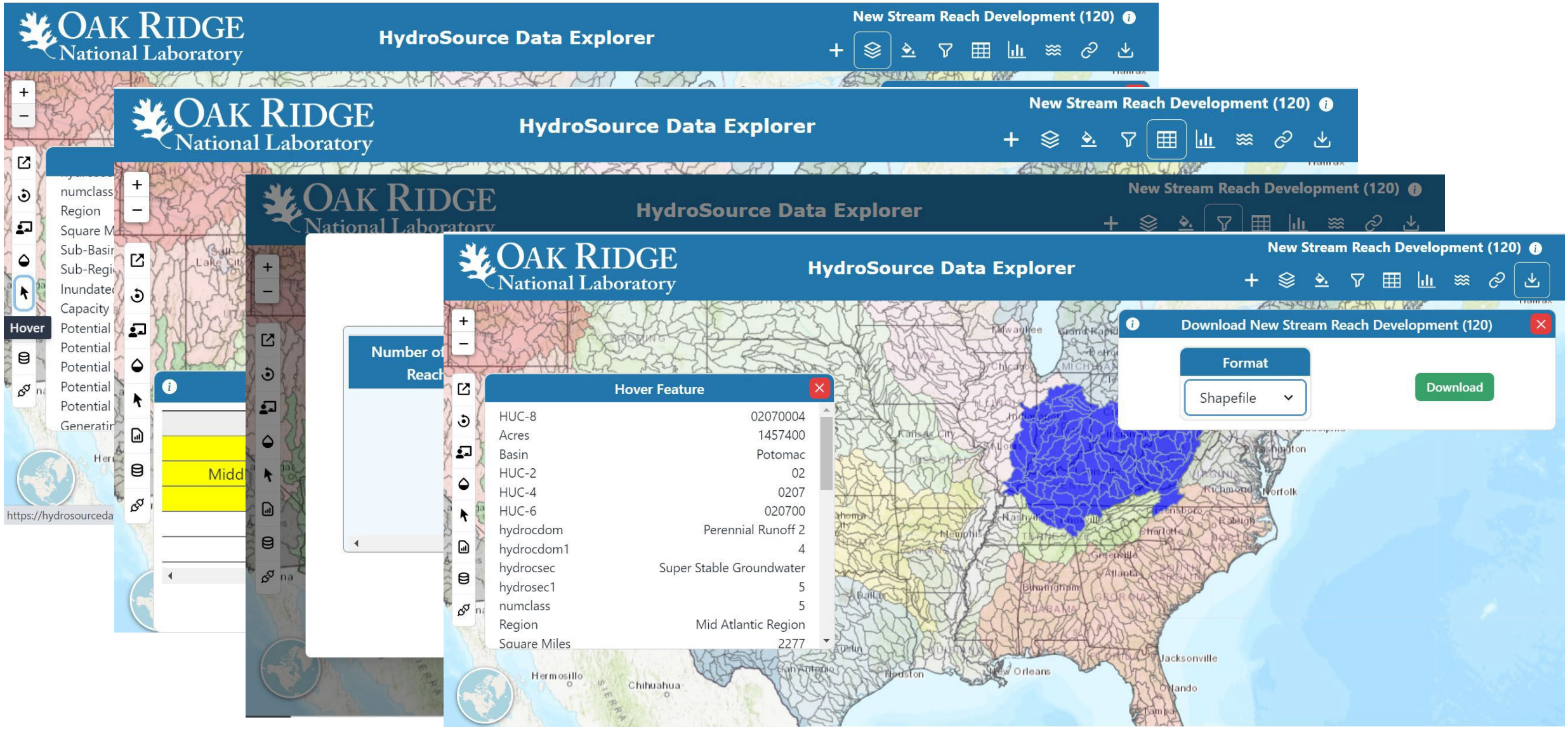
Performance: Accomplishments and Progress

HydroSource Data Explorer

- Estimating hydropower generation and capacity by administrative or hydrologic boundaries or other attributes
- Visualizing hydropower potential of a basin
- Analyzing existing facilities/hydrology around a new development site
- Identifying hydropower plants that are up relicensing in a basin or state
- Recognizing mitigations associated with the hydropower plants that are up for relicensing



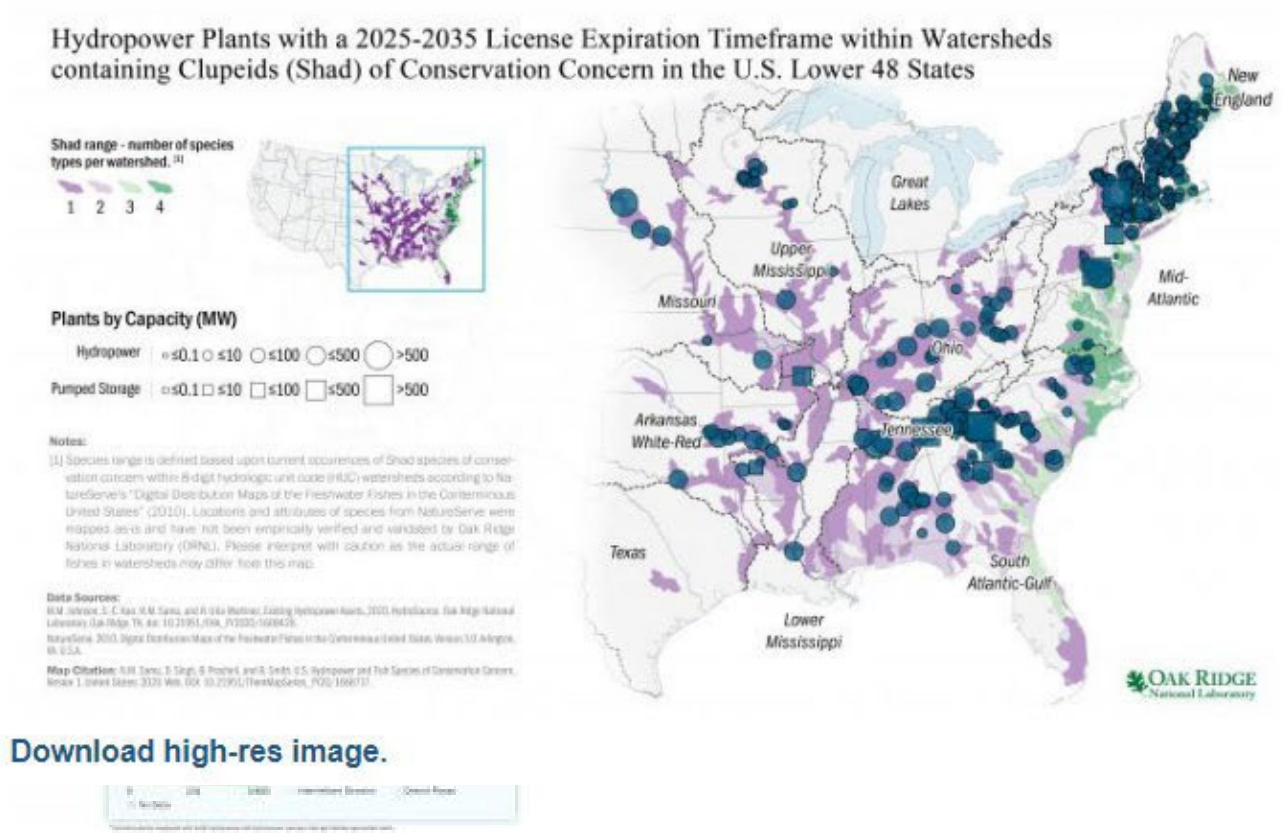
Visualizing Future Hydropower Potential of a Basin



Performance: Accomplishments and Progress

The 2020 National Hydropower Map

Thematic Map Series: U.S. Hydropower and Fish Species of Conservation Concern



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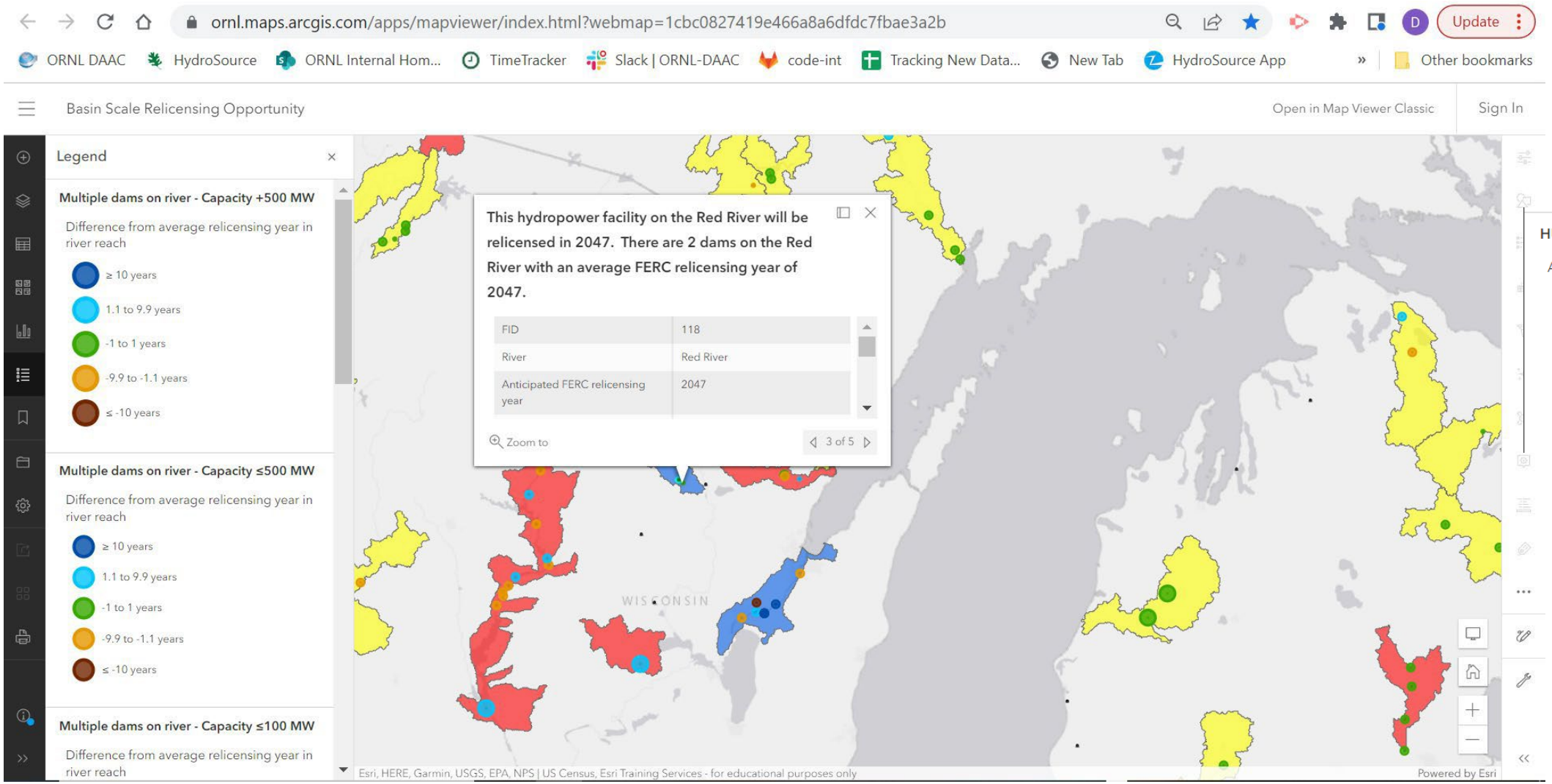
Performance: Accomplishments and Progress

Basin Scale Relicensing Opportunity



Performance: Accomplishments and Progress

Web Analytics

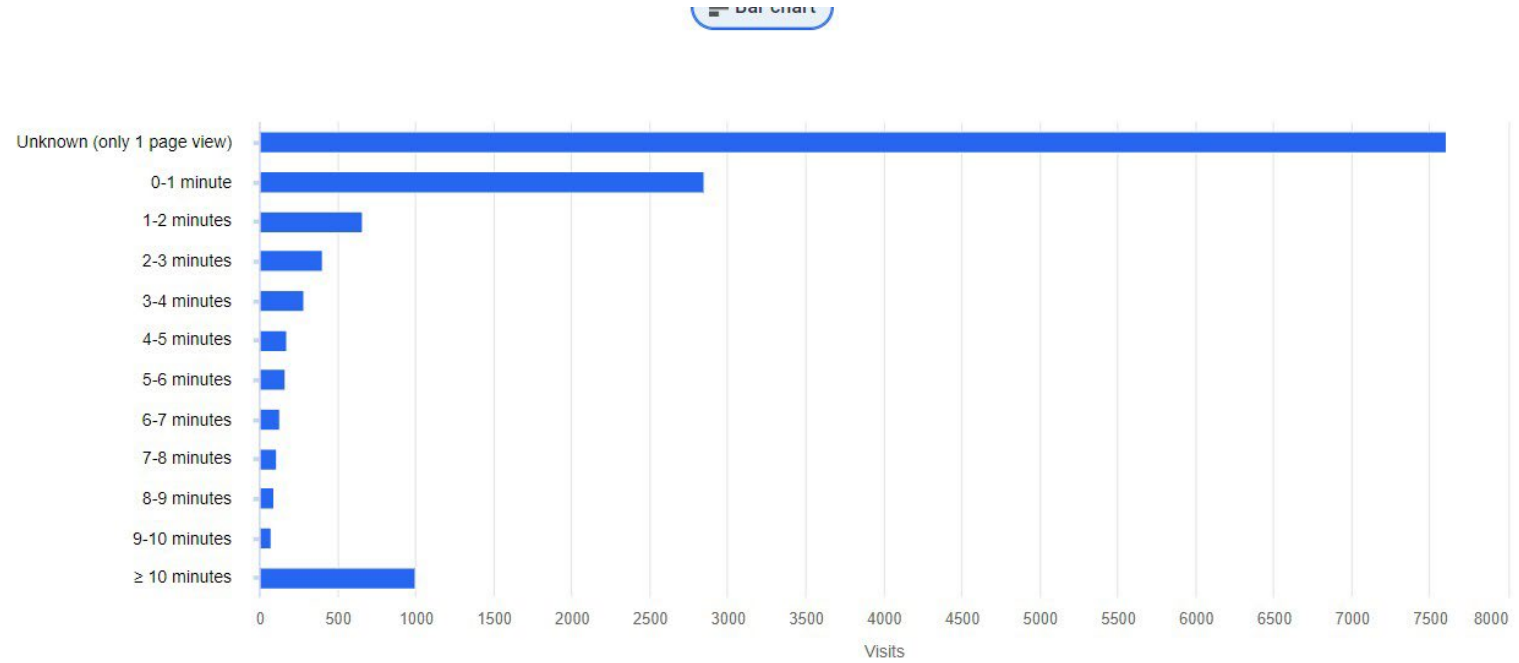
Siteimprove

6/30/2022 4:03 AM
Period: 1/1/2021 - 6/28/2022

Site	Period
Hydrosource	**1/1/2021 - 6/28/2022**

Visit Length

ypically



Performance: Accomplishments and Progress

Web Analytics

Most Popular Pages

Your most popular pages, based on the number of page views.

#	Title	URL	Page views			
1	Home | Hydrosource	https://hydrosource.ornl.gov				
2	Datasets | Hydrosource	https://hydrosource.ornl.gov/datasets				
3	Maps | Hydrosource	https://hydrosource.ornl.gov/maps				
4	Tools | Hydrosource	https://hydrosource.ornl.gov/tools				
5	Existing Hydropower Assets (EHA), 2021 | Hydrosource	https://hydrosource.ornl.gov/dataset/EHA2021				
6	US Hydropower Potential from Existing Non-powered Dams (greater than 1MW) | Hydrosource	https://hydrosource.ornl.gov/dataset/us-hydropower-potential-existing-non-powered-dams-greater-1mw				
7	Recent Publications | Hydrosource	https://hydrosource.ornl.gov/publications				
7	Recent Publications | Hydrosource	https://hydrosource.ornl.gov/publications	878 1.9 %	604 4.5 %	1.45	
8	Hydropower Potential from New Stream-Reach Development for the Conterminous United States. | Hydrosource	https://hydrosource.ornl.gov/dataset/hydropower-potential-new-stream-reach-development-conterminous-united-states	812 1.8 %	593 4.4 %	1.37	
9	The 2020 National Hydropower Map, Version 1 | Hydrosource	https://hydrosource.ornl.gov/map/2020-national-hydropower-map-version-1	744 1.6 %	565 4.2 %	1.32	
10	Existing Hydropower Assets Plant Dataset, 2020 | Hydrosource	https://hydrosource.ornl.gov/dataset/existing-hydropower-assets-plant-dataset-2020	681 1.5 %	472 3.5 %	1.44	
11	Hydropower Infrastructure - LAkes, Reservoirs, and RIvers (HILARRI) | Hydrosource	https://hydrosource.ornl.gov/dataset/hydropower-infrastructure-lakes-reservoirs-and-rivers-hilarri	672 1.5 %	532 3.9 %	1.26	

Performance: Accomplishments and Progress

- Redesigned and developed HydroSource Data Portal using the Findable, Accessible, Interoperable, and Resuable (FAIR) principles.
- Developed an Application Programming Interface (API) for the HydroSource Data Explorer.
- Published 30 datasets over the past 3 years.
- Prepare HydroSource Platform for “Big Data”
- Analyzed the potential impacts of expanding the existing 13000+ miles of wild and scenic rivers within US on new and existing hydropower assets.
- Collaborated with Internet of Water (IoW) to enable HydroSource as a water data hub.
- Collaborated with PNNL, Stanford University, U Maine and UNH to investigate water data access at the basin scale.

Performance: Accomplishments and Progress

- Peer Reviewed Journal Articles
  - Debjani Singh, Brennan Smith and Corey Vezina. 2022. HydroSource : A Data Discovery Platform for Hydropower Assets. Accepted in AGU EOS
- Conference Presentation
  - Singh, Debjani, Forest Carter, Nicole M. Samu, Megan Johnson, and Brennan Smith. "HydroSource: A National Water-Energy digital platform for Hydropower Data Accessibility and Use." In *AGU Fall Meeting Abstracts*, vol. 2020, pp. H145-0008. 2020.
  - Ruggles, Thomas Alan, Debjani Singh, and Brenda M. Pracheil. "Accessibility, Usability, and Visualization of HydroSource Data for River Basin-Scale Decision Making." In *AGU Fall Meeting 2021*. AGU, 2021.
  - Singh, Debjani. “Enhancing the FAIRness of Hydropower Data through the HydroSource Digital Platform.” In *AGU Fall Meeting 2021*. AGU, 2021.

Future Work

- Improve metadata on the landing page to improve data access.
- Advanced search options that helps users filter down results (e.g. subject, keywords, science themes, map type, file type, year, region).
- Dynamic visualizations to help visualize and analyze complex datasets.
- Collect more user metrics to analyze the impact of HydroSource data across organizations, domains and demographics.
- Integrate and link new and updated datasets into HydroSource Data Explorer and HydroSource Data Model.
- Landing page for associated organizations so users could find related data (e.g. EPA, EIA).
- Form a dedicated user base or a user working group from diverse stakeholder groups who will help define the future direction of HydroSource

Q&A