



Basin Scale Opportunity Assessment Initiative

Kyle Larson

Pacific Northwest National Laboratory

kyle.larson@pnnl.gov; 509-371-7207

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Basin Scale Opportunity Assessment (BSOA) Initiative:

Create integrative approaches to exploring pathways through which hydropower generation may be increased while protecting and potentially improving environmental conditions.

The Challenge: Expand the spatial scale and contextual scope in which hydropower development is traditionally evaluated to achieve potentially greater overall generation and environmental benefit

Who Benefits: Developers, regulators, engaged stakeholders

Key Partners: Oak Ridge National Laboratory (ORNL, Co-Investigators), BSOA National Steering Committee¹, Snohomish County Public Utility District (Partner)

¹ Steering committee includes members of 2010 Hydropower MOU agencies (DOE, U.S. Army Corps of Engineers, US Bureau of Reclamation) and the National Hydropower Association, Hydropower Reform Coalition, Portland General Electric, The Nature Conservancy, and Low Impact Hydropower Institute.

Next Generation Hydropower (HydroNEXT)

Optimization

- **Optimize technical, environmental, and water-use efficiency of existing fleet**
- **Collect and disseminate data on new and existing assets**
- **Facilitate interagency collaboration to increase regulatory process efficiency**
- Identify revenue streams for ancillary services

Growth

- Lower costs of hydropower components and civil works
- Increase power train efficiency for low-head, variable flow applications
- Facilitate mechanisms for testing and advancing new hydropower systems and components
- Reduce costs and deployment timelines of new PSH plants
- Prepare the incoming hydropower workforce

Sustainability

- Design new hydropower systems that minimize or avoid environmental impacts
- Support development of new fish passage technologies and approaches
- **Develop technologies, tools, and strategies to evaluate and address environmental impacts**
- Increase resilience to climate change

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The Impact

- **Target:** Create a platform for national labs, academia, industry, regulators, and other stakeholders to integrate information relevant to hydropower development
- Improve information sharing and developers' ability to identify more feasible options
- Enable more rapid and interactive identification of sustainable hydropower development opportunities.

Next Generation Hydropower (HydroNEXT)

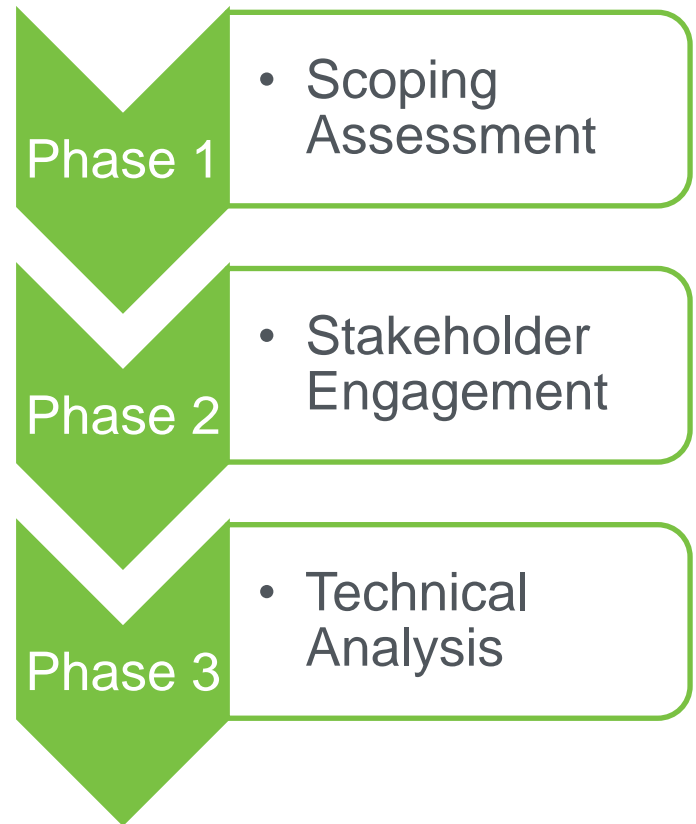
Sustainability

- Design new hydropower systems that minimize or avoid environmental impacts
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The Impact

- **Target:** Create a flexible framework that can accommodate basin-specific planning concerns
- Provide objective platform for industry, regulators, and engaged stakeholders to explore the opportunity space at a basin scale.
- **Final Products:**
 - Scoping assessments for the Connecticut, Roanoke, and Bighorn River basins
 - Demonstration web GIS tool that showcases Basin Scale Opportunity Assessment approach and provides a launch point for identifying case study applications and tech transfer opportunities.

- Action item in the 2010 Hydropower Memorandum of Understanding
- Began in FY11 with pilot assessment of Deschutes River Basin in central Oregon
 - Focused on improving water operations modeling capability of collaborative stakeholder groups in basin
- FY13 began developing three-phase approach to opportunity assessments
 - Conduct Phase 1 assessments for three U.S. river basins
- FY14-16 focused on implementing and improving Phase 1 approach, including development of a demonstration web tool.



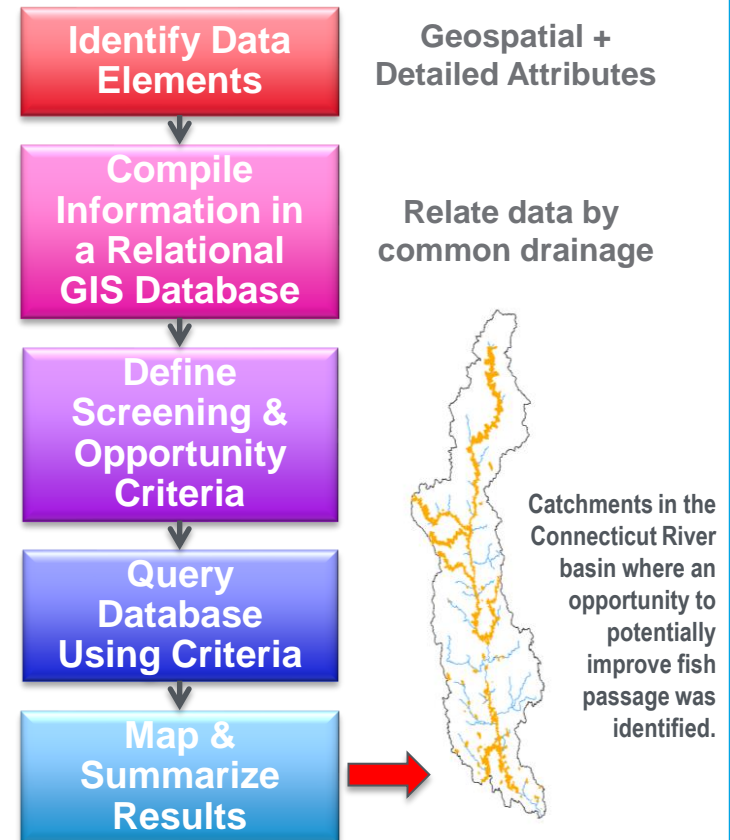
Phase 1 – Initial identification and screening of possible complementary hydropower and environmental opportunities

Stepwise Process

- 1 – Plan and Organize
- 2 – Select Basin
- 3 – Inform Key Stakeholders
- 4 – Compile Information
- 5 – Identify Hydropower Opportunities
- 6 – Identify Environmental Issues
- 7 – Identify Combined Hydropower-Environmental Opportunities
- 8 – Report Preliminary Assessment
- 9 – Outreach and Obtain Feedback
- 10 – Finalize Assessment



Geospatial data model that facilitates interactive identification of potential hydropower-environmental opportunities (Steps 5–7)



Key issues addressed in FY14–16

- Integration of locally relevant environmental data
- Improve access, understanding, and visualization of underlying data used in assessments
- Explore interactions at multiple hydrographic scales
- Enable user-driven opportunity scenarios to better reflect local complexities and stakeholder values.

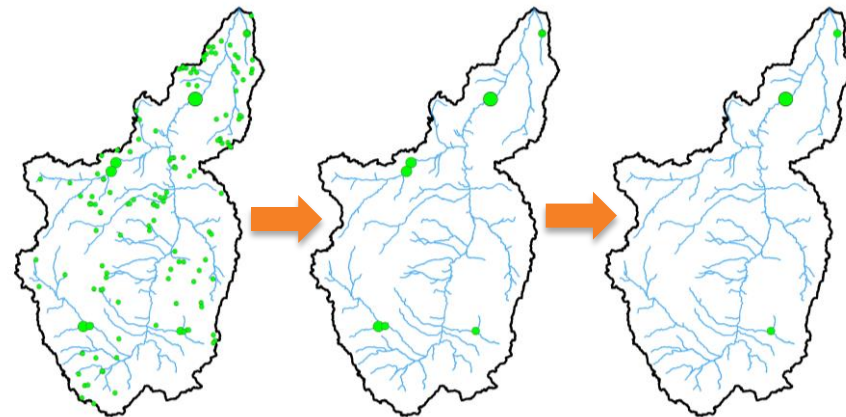
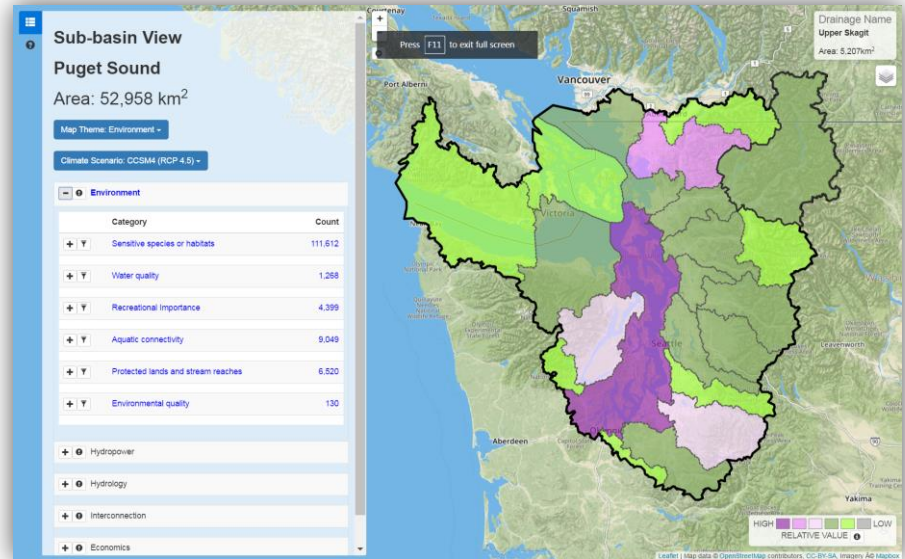


Figure illustrates the number of potential hydropower sites in the Bighorn Basin before (left) and after (middle) screening criteria are applied, and the number of sites the met criteria for potential environmental opportunities (right).

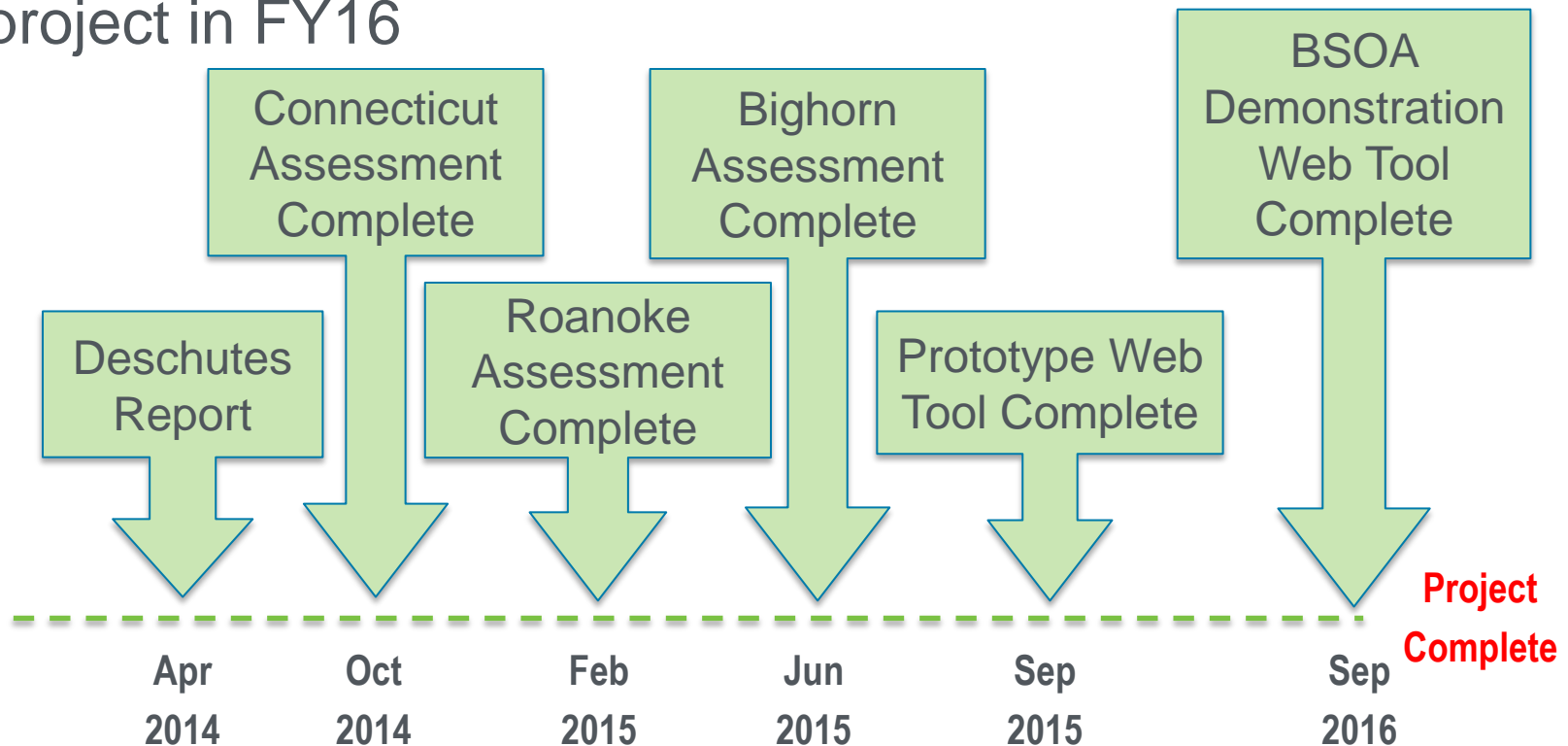
Potential Capacity (MW) ● 0.00 - 0.10 ● 0.11 - 0.40 ● 0.41 - 1.06 ● 1.07 - 9.20

FY14–16 focused primarily on dissemination and refinement

- Report published on BSOA pilot project in the Deschutes
- Reports published for the Connecticut, Roanoke, and Bighorn assessments
- Presented at 2014 HydroVision and American Fisheries Society Annual Meetings
- Developed demonstration web tool
- Leveraged Pacific Northwest National Laboratory (PNNL) Lab Directed Research and Development (LDRD) project to improve web tool and expand application of BSOA



- Project initiated in FY11, completed in FY16
- Development of web tool extended to leverage LDRD
- Peer reviewed manuscript delayed due to evolution of project in FY16



Budget History					
FY2014		FY2015		FY2016	
DOE	Cost-share	DOE	Cost-share	DOE	Cost-share
\$850K	\$0	\$200K	\$0	\$0	\$50K

- 100% of the budget has been expended and the project has been completed.
- ~\$50K cost-share from PNNL LDRD project in FY16.

Partners, Subcontractors, and Collaborators:

ORNL, BSOA National Steering Committee¹, NHA, Hydropower Reform Coalition, U.S. Fish & Wildlife Service, NOAA Marine Fisheries Service, Portland General Electric, The Nature Conservancy, Low Impact Hydropower Institute, TransCanada, Connecticut River Watershed Council, Wyoming State Engineers Office, Montana Fish, Wildlife, and Parks, Crow Tribe, Bighorn River Alliance, Snohomish County Public Utility District

¹ BSOA Steering Committee includes members of 2010 Hydropower Memorandum of Understanding (MOU) agencies (DOE, U.S. Army Corps of Engineers, US Bureau of Reclamation) and the National Hydropower Association, Hydropower Reform Coalition, Portland General Electric, The Nature Conservancy, and Low Impact Hydropower Institute.

Communications and Technology Transfer:

- Technical poster at HydroVision 2014
- Four oral presentations at AFS 2014 Annual Meeting
- Four technical reports from 2014–2015
- Transfer/deployment of BSOA demonstration web tool (*in progress*)
- Peer-reviewed manuscript (*in progress*).

FY17/Current research: N/A

Proposed future research:

- Pursue funding and use agreements to make BSOA demonstration web tool publically available to facilitate ongoing outreach to industry.
- Work with potential developers and stakeholders in a basin-scale assessment that includes sites actually being considered for development.