WASHINGTON STATE UNIVERSITY
Energy Program

Pumped Storage Hydropower Siting Information Study

PSH Siting Topics: Aquatic Ecosystems, Water Quality, and Water Quantity

WSU Energy Program

October 9, 2024

How to Access Captions/Como Ver Subtítulos

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Escanea el código QR para acceder a los subtítulos

Scan the QR code for captions

Welcome and a few reminders…

- This meeting is being recorded and will be available on the study website—along with the slides and a meeting summary
- Please remain muted unless you are speaking
- As needed, please rename yourself with your affiliation or workplace in Zoom
- Attendees will be able to chat everyone in the meeting
  - If you are experiencing technical issues, please chat directly to "hosts and panelists" (or email to hsherrow@rossstrategic.com).
- To ask questions or join discussion, please use the "raise your hand" button to indicate you would like to speak; chat can also be used for Q&A
- Please be respectful of this process. Allow everyone the chance to speak and listen actively to understand others' views

WSU Energy Program

- Self-supporting department within Washington State University based in Olympia
- Other programs: green transportation education and outreach, community solar, Washington state energy codes (residential) support, community energy efficiency, emerging technologies, and more

WSU Energy Program website: https://www.energy.wsu.edu

WSU PSH Siting Study Team

- Karen Janowitz

WASHINGTON STATE UNIVERSITY
Energy Program

- Terri Parr

WASHINGTON STATE UNIVERSITY

- Tom Beierle
- Susan Hayman
- Hogan Sherrow

ROSS STRATEGIC

- Jeff Boyce

Meridian Environmental, Inc.

Today's Meeting Objectives

- Understand key pumped storage hydropower (PSH) impacts and opportunities related to aquatic ecosystems, water quality, and water quantity and discuss participants' interests and issues related to these topics
- Provide project update and overview of topics for upcoming PSH study meetings

Agenda Overview

12:00 – 12:15 PM	**Welcome and Quick Ice Breaker**
12:15 – 12:20 PM	**Study Overview and Update**
12:20 – 12:40 PM	**PSH and Aquatic Ecosystems, Water Quality, and Water Quantity**
12:40 – 1:00 PM	**Washington State Water Availability**
1:00 – 1:10 PM	***Break***
1:10 AM – 2:15 PM	**Discussion of Water Issues (Two rounds of Breakout Sessions)**
2:15 – 2:25 PM	**Breakout Session Highlights**
2:25 – 2:30 PM	**Next Steps, Wrap up, and Adjourn**

Quick Icebreaker—Using Mural

- Mural is brainstorming software that allows people to share ideas through the use of virtual post-its and whiteboard
- Follow the link for mural and use the virtual post-it’s to answer a question

Pumped Sto...

Icebreaker!
Add a yellow "sticky note" to one or more panels with your response

If you wish to upvote something to demonstrate your concurrence, hover your cursor over the bottom left of any sticky note and select the thumbs up reaction. If that doesn't work for you, simple click and drag one of the colored "thumbs up" icons left of the mural board onto the note.

sticky note from the blank colored notes below the board, or simply
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text to it. Simply double-click on the note and start
too, just by clicking and dragging.

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lso select an object and then click on the

What is your favorite fall food?	What is your favorite fall place?	What is your favorite fall activity?

Outline

1 KAREN: Water Availability

2 TOM: Water Quality

3 HOGAN: Water Quality

4 SUSAN: Water Availability

5 ICEBREAKER!!

32%

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To zoom in our out, use the wheel on your mouse or adjust the zoom percentage with the - /+ tool in the lower right corner of your screen

32%

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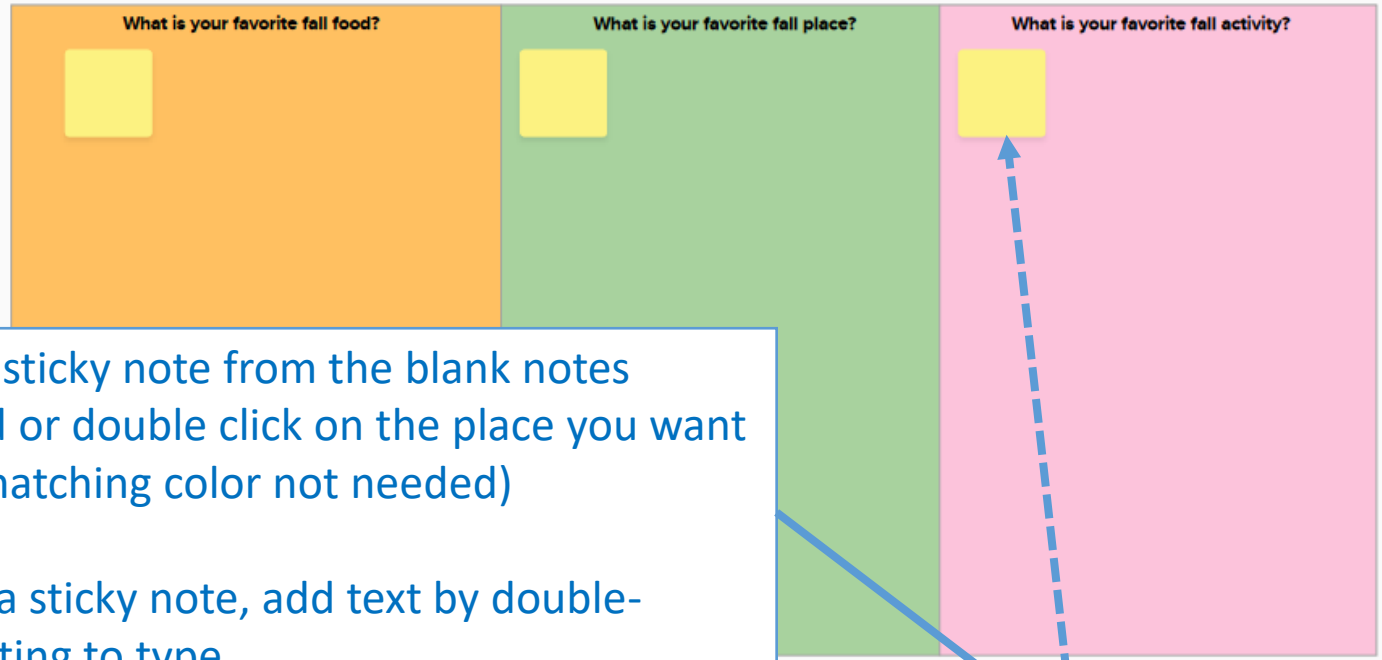

Click and drag a sticky note from the blank notes below the board or double click on the place you want to add a note (matching color not needed)

Once you place a sticky note, add text by double-clicking and starting to type

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5 ICEBREAKER!!

32%

Icebreaker Questions (answer as many as you like)

- *What is your favorite fall food?*
- *What is your favorite fall place?*
- *What is your favorite fall activity?*

- Copy-paste link from Zoom chat box into an internet browser
- Keep Zoom and Mural open simultaneously
- Add your name (or remain anonymous) & click "Enter as a visitor"

Study Overview and Update

Karen Janowitz, WSU Energy Program

PSH Siting Study Goal

Identify and understand issues and interests of various stakeholders and federally recognized Indian tribes related to **areas where pumped storage might be sited**.

No specific PSH projects are being promoted or sited in this study.

Section 306 of House Bill 1216 (2023) on Clean Energy Project Siting:

https://lawfilesext.leg.wa.gov/biennium/2023-24/Pdf/Bills/Session%20Laws/House/1216-S2.SL.pdf?q=20240327114612

Why a PSH Siting Study?

- **Clean Energy Transformation Act (CETA) (SB 5116, 2019)**
  - Washington state's electricity supply:
    - After 2025 – no coal in utility resource mix
    - By 2030 – greenhouse gas neutral electricity supply
    - By 2045 – 100% renewable or non-emitting sources
- **PSH is proven and can provide grid reliability when using renewables**
- **Understand issues concerning PSH siting to work towards avoiding impacts and disputes**

Pumped Storage Hydro Siting Study Process

- PSH research
- Outreach, Engagement, Meetings, Webinars
  - Provide information on PSH
  - **Provide opportunities to hear from you**
- Mapping
  - Baseline map of theoretical PSH locations from National Renewable Energy Laboratory (NREL)
  - Revised map based on input (tentative)
- Final report – due June 30, 2025

Future Statewide Online Public Meetings

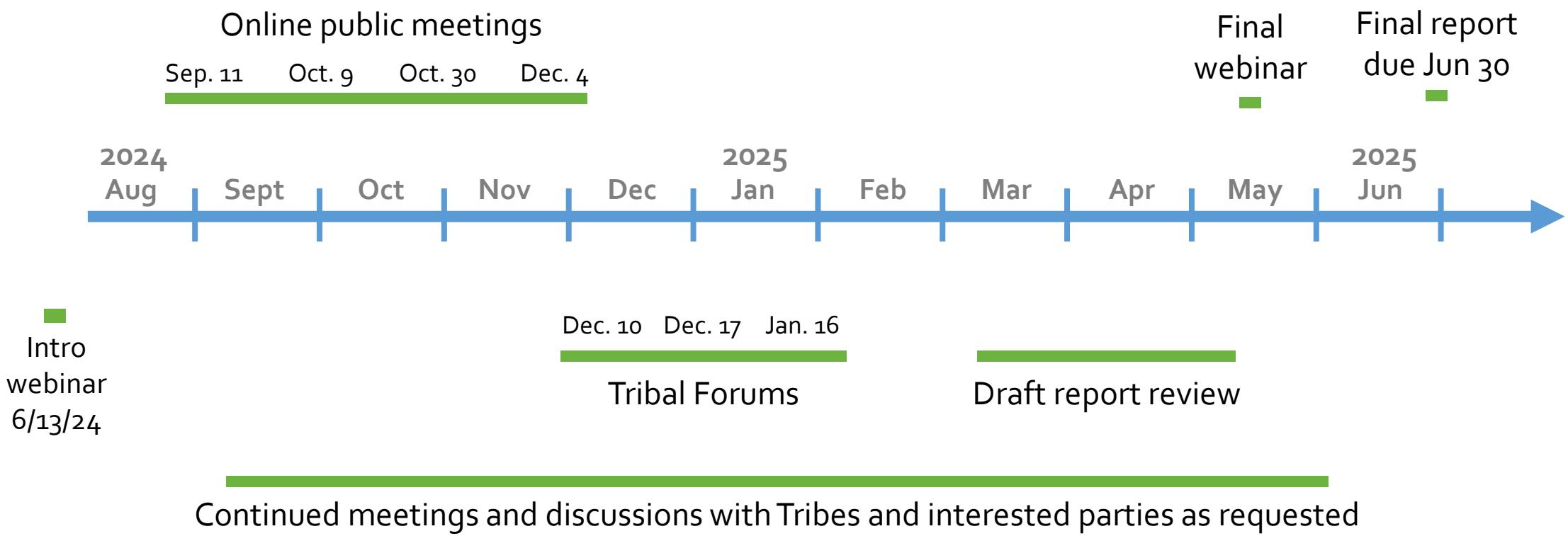
Meetings are 9:30 AM to 12:30 PM Pacific Time, subject to change

- October 30
  - Terrestrial ecosystems
  - Geology and soils
  - Air quality, greenhouse gas emissions
  - Land use and aesthetics
- December 4
  - Permitting and licensing
  - Other pumped storage and mechanical/gravity-based technologies

Tribal Engagement

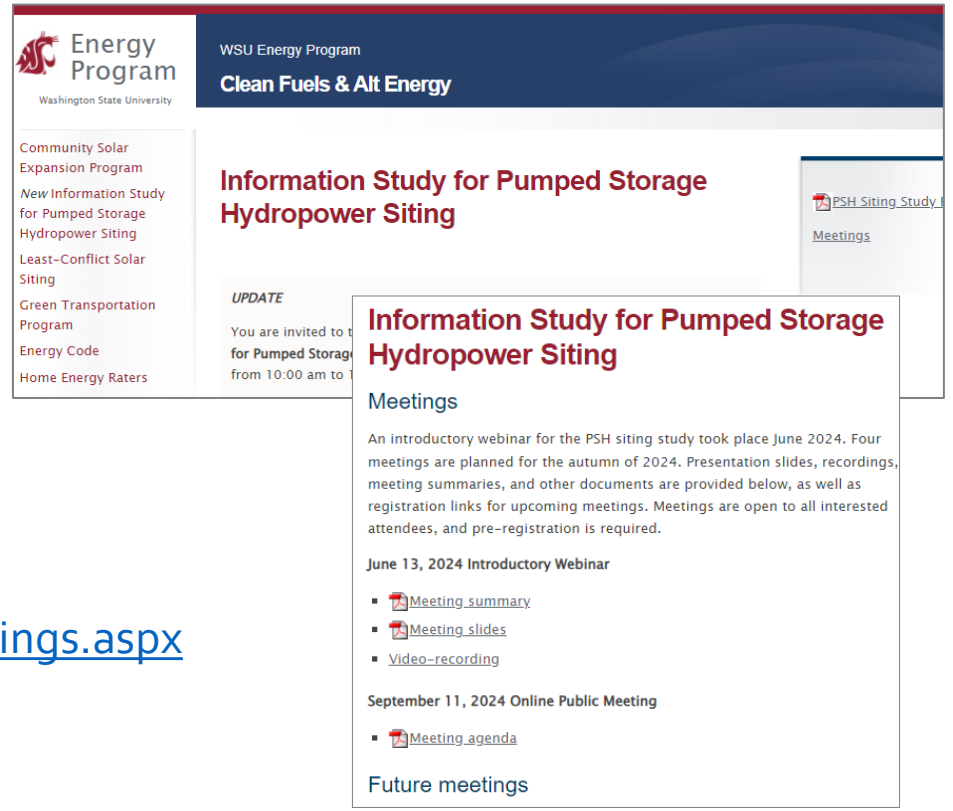
- Three Forums for Tribal leaders and staffs
- Attendance and discussion at Tribal conventions & conferences
- Further outreach and meetings

Timeline *(subject to change)*



WSU PSH Website and Email List

WSU Energy Program PSH Siting Study Webpages:
https://www.energy.wsu.edu/CleanFuelsAltEnergy/PSHSiting.aspx



PSH Siting Study Meeting Webpage:

- Meeting summary
- Meeting video-recording
- Meeting slides

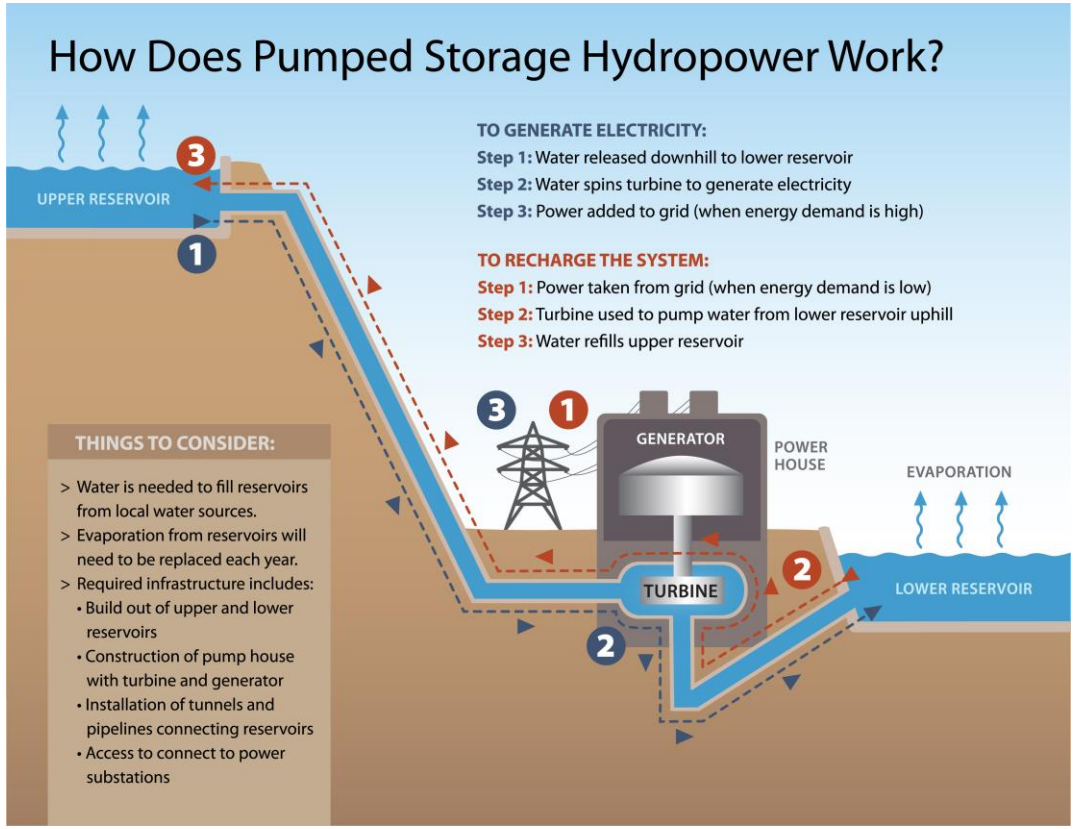
https://www.energy.wsu.edu/CleanFuelsAltEnergy/PSHSiting/Meetings.aspx

Sign up for the email distribution list:
https://www.energy.wsu.edu/CleanFuelsAltEnergy/PSHSiting/PHSSitingEmailRegistration.aspx

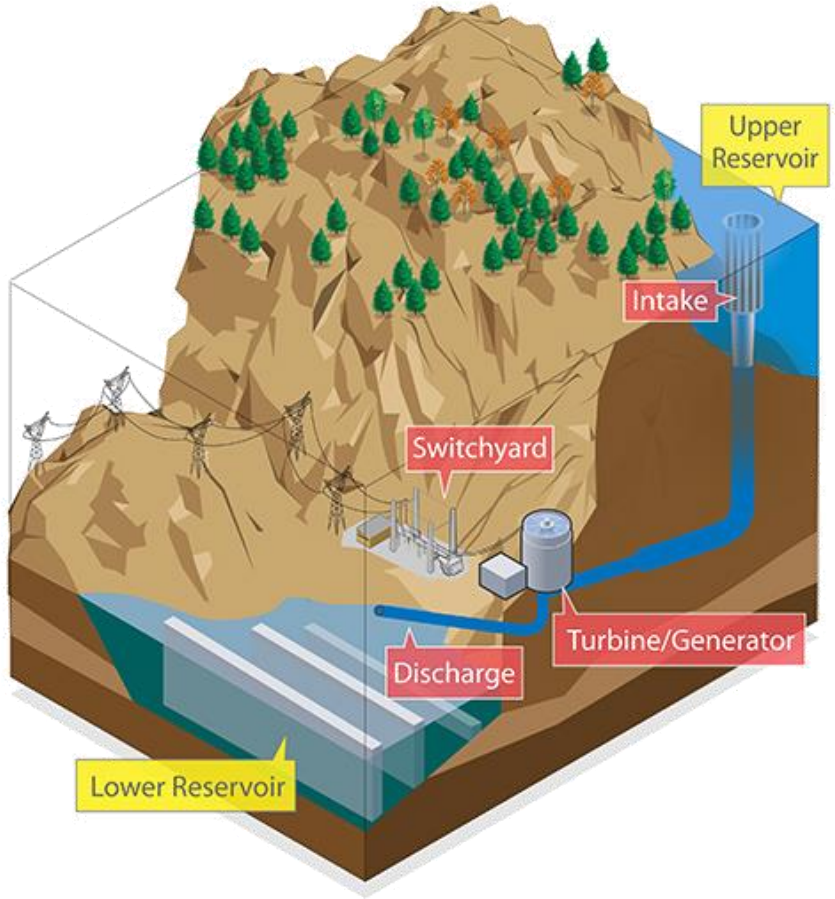
What is Pumped Storage Hydropower?

- "Water battery"
- Long-duration energy storage technology
- Stores energy in an upper reservoir, generates energy when water flows to a lower reservoir

This study focuses on closed-loop, where reservoirs are not connected to any existing water bodies



PSH Benefits & Drawbacks



- Benefits
  - Provides electrical system reserve capacity
  - Supports grid reliability
  - Balances electricity supply and demand
  - Provides operational flexibility

- Drawbacks
  - Siting may be difficult
    - Potential impacts may include to Cultural Resources and the environment
  - Needs water to initially fill closed-loop reservoirs, and "top" off
  - Long construction period, expensive construction costs
  - Long, extensive permitting and licensing process

Questions?

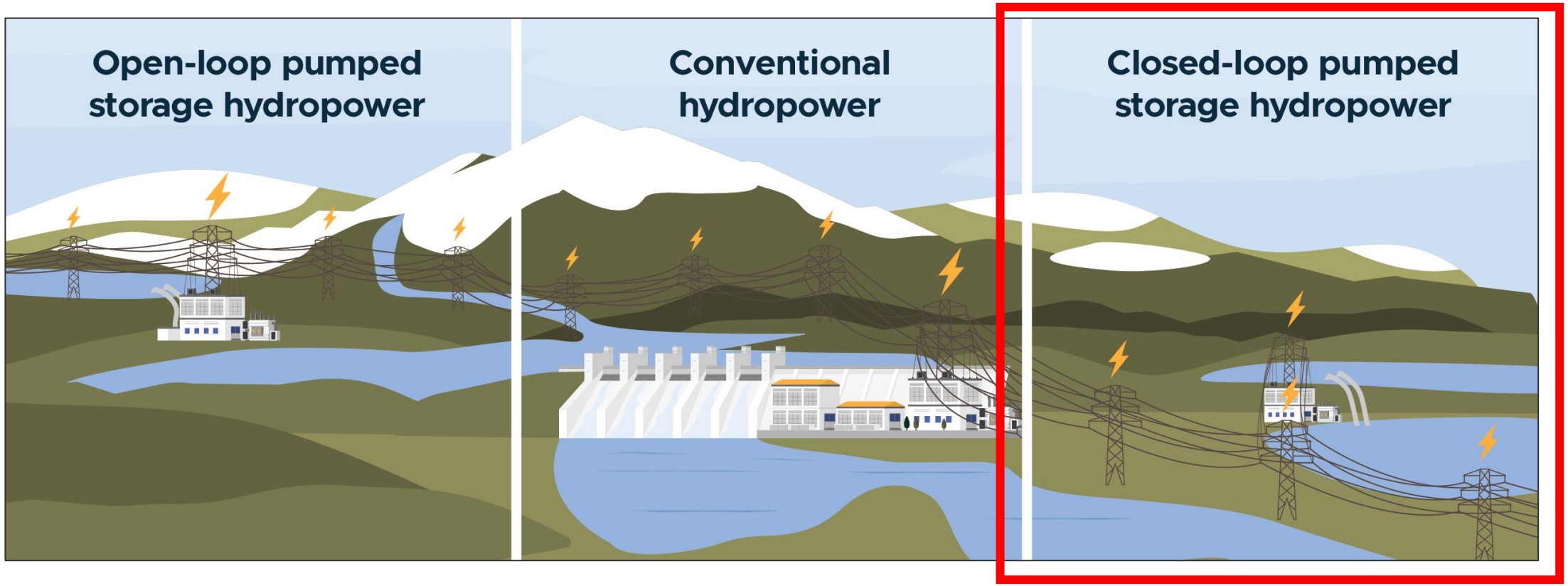
HydroWIRES
U.S. DEPARTMENT OF ENERGY

Aquatic Ecology Impacts of Pumped Storage Hydropower

Brenda Pracheil, Ph.D.
Fisheries Biologist
Pacific Northwest National Laboratory

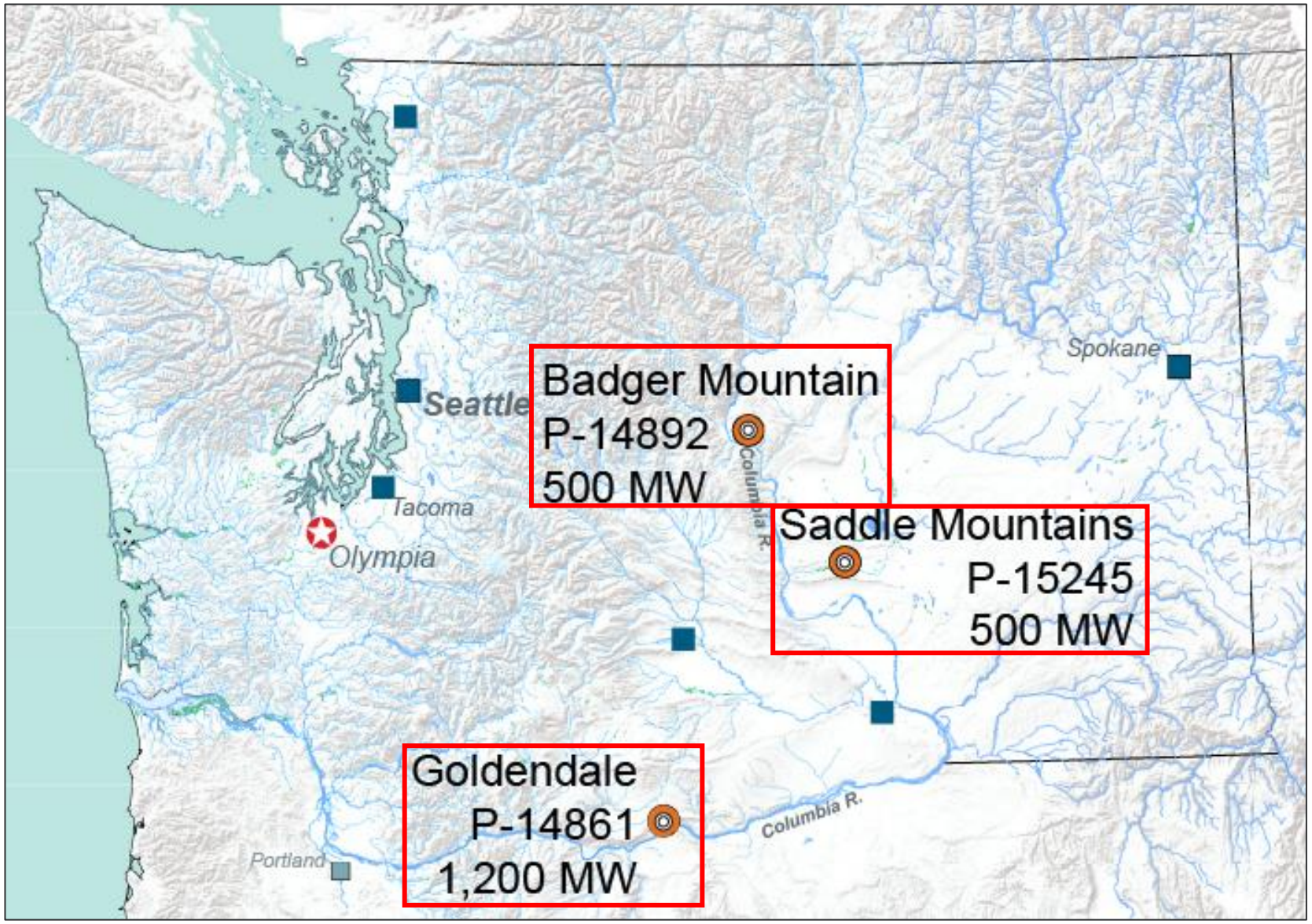
U.S. DEPARTMENT OF ENERGY

Pumped storage hydropower



Pracheil et al. *in revision.* Environmental impacts of closed-loop pumped storage hydropower. PNNL HydroWIRES report.

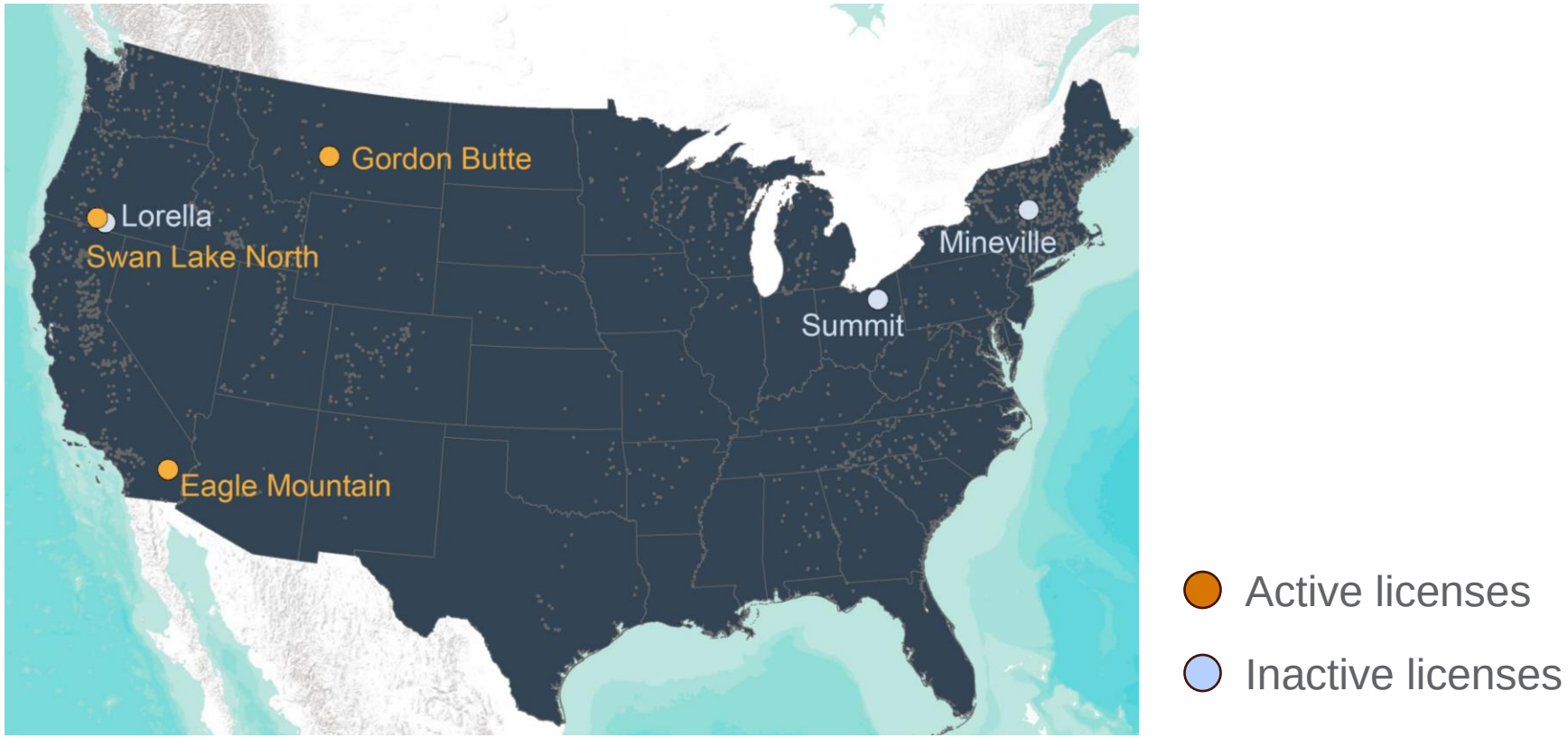
Proposed PSH distribution



Data: Johnson, Uria-Martinez. 2023. US Hydropower Development Pipeline Data. Oak Ridge National Lab.

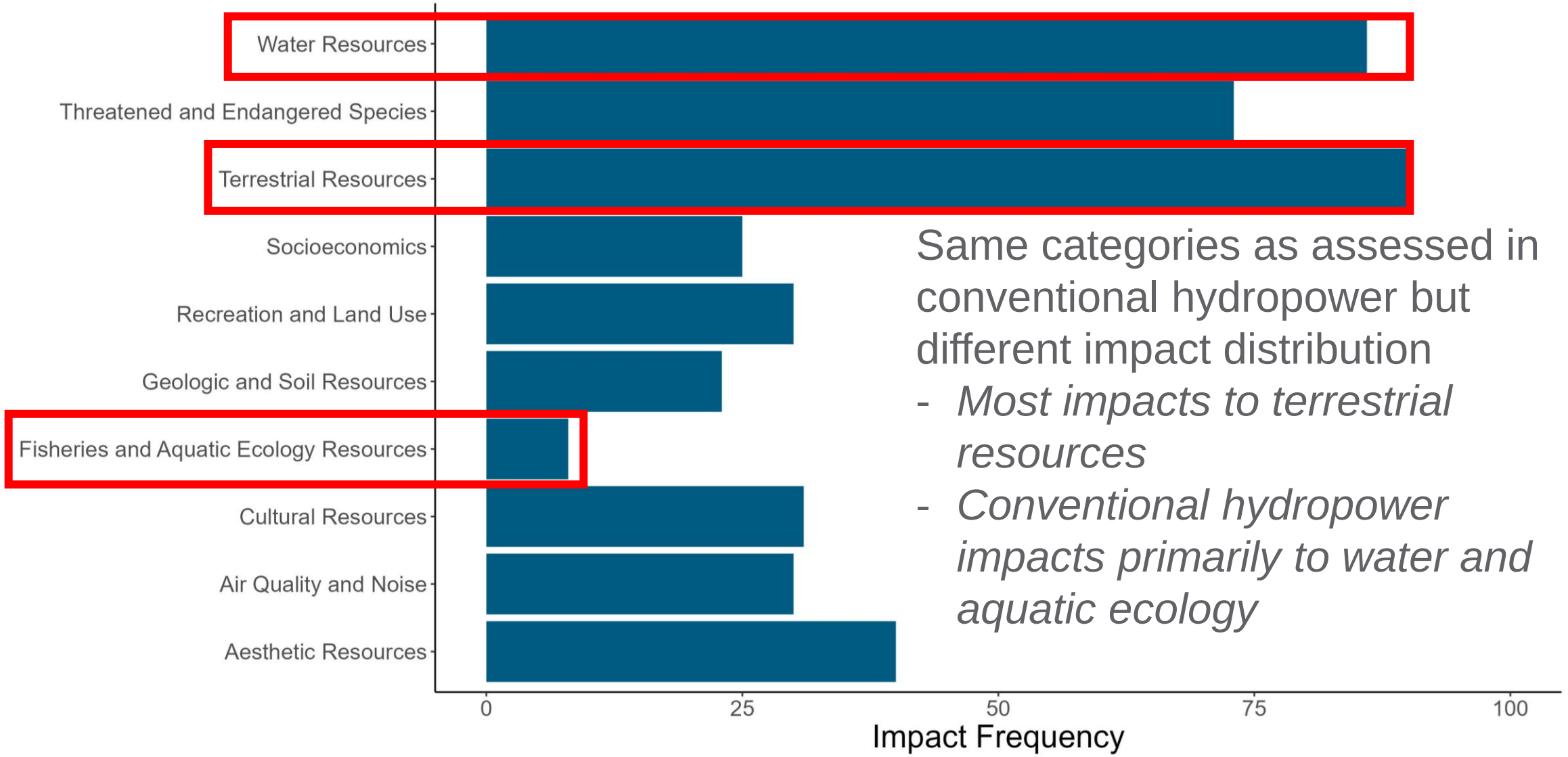
Closed-loop PSH report (forthcoming)

- Summarized NEPA documents from six projects (all EISs) **not in active licensing proceedings** (three have active licenses)



Pracheil et al. *in revision*. Environmental impacts of closed-loop pumped storage hydropower. PNNL HydroWIRES report.

Topics addressed by environmental impact assessments in closed-loop PSH

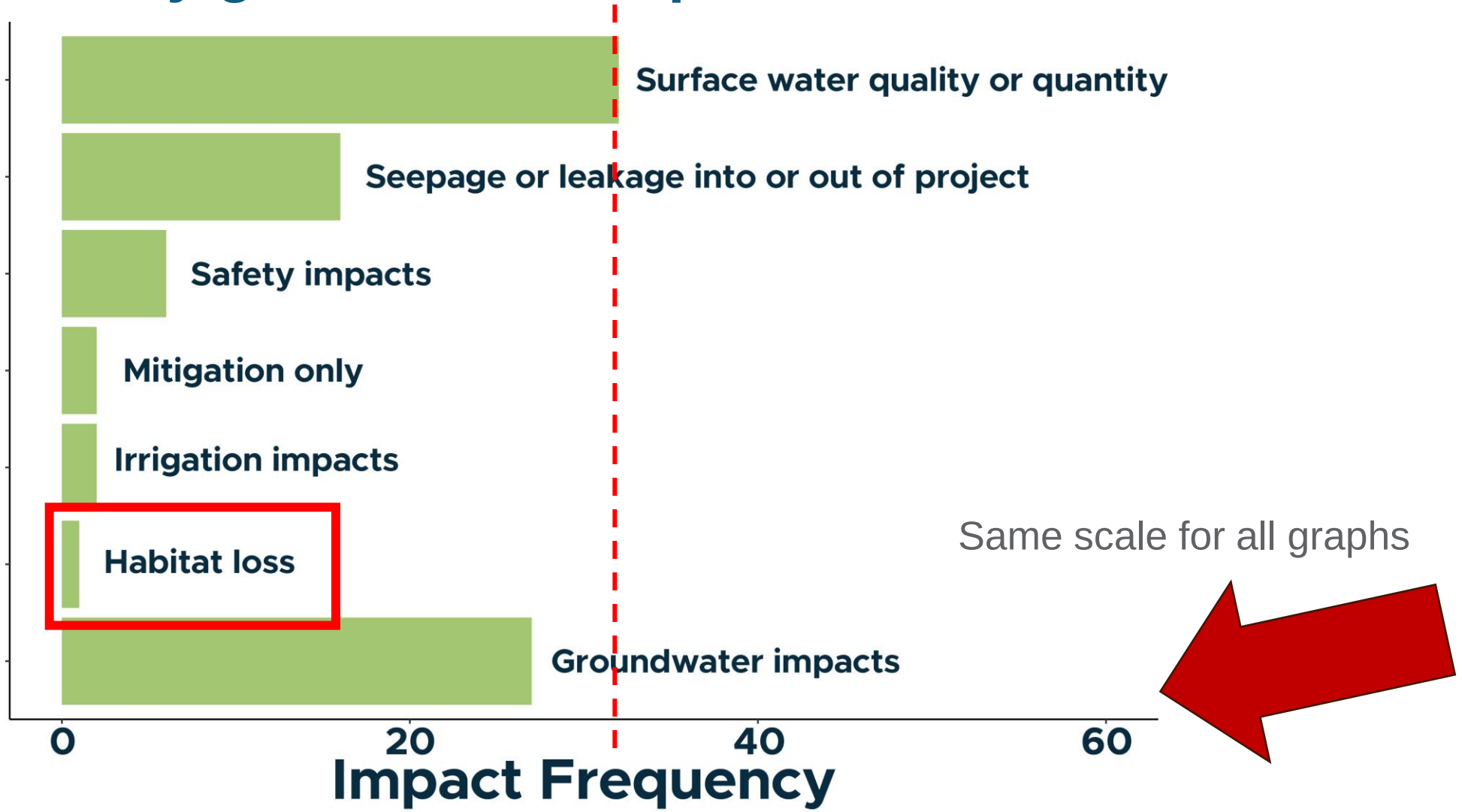


Same categories as assessed in conventional hydropower but different impact distribution

- *Most impacts to terrestrial resources*
- *Conventional hydropower impacts primarily to water and aquatic ecology*

Pracheil et al. *in revision.* Environmental impacts of closed-loop pumped storage hydropower. PNNL HydroWIRES report.

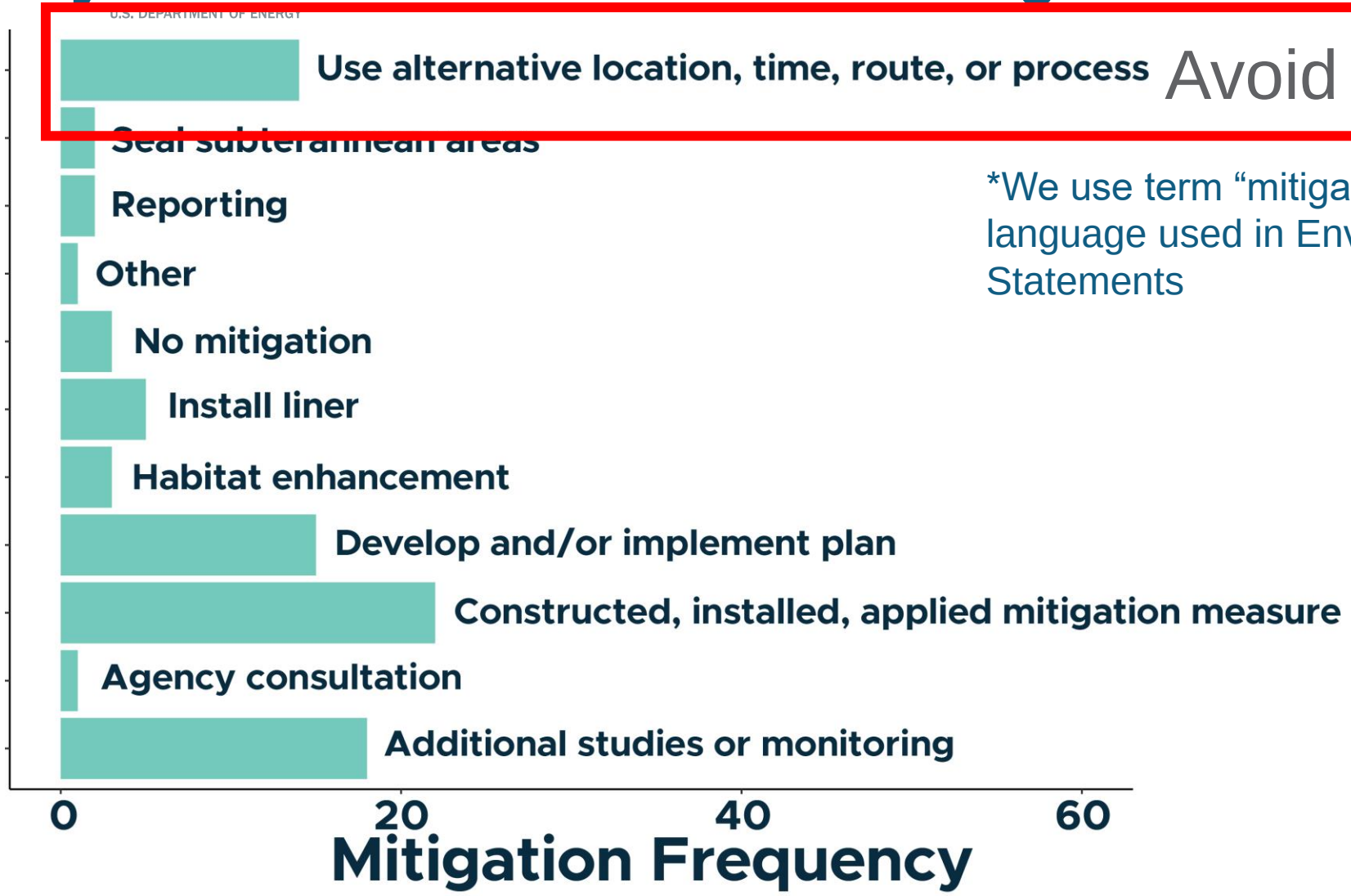
Surface water quality and quantity impacts most common water resource impact followed by groundwater impacts



Same scale for all graphs

Pracheil et al. *in revision.* Environmental impacts of closed-loop pumped storage hydropower. PNNL HydroWIRES report.

Water resource mitigations*



Avoid impact

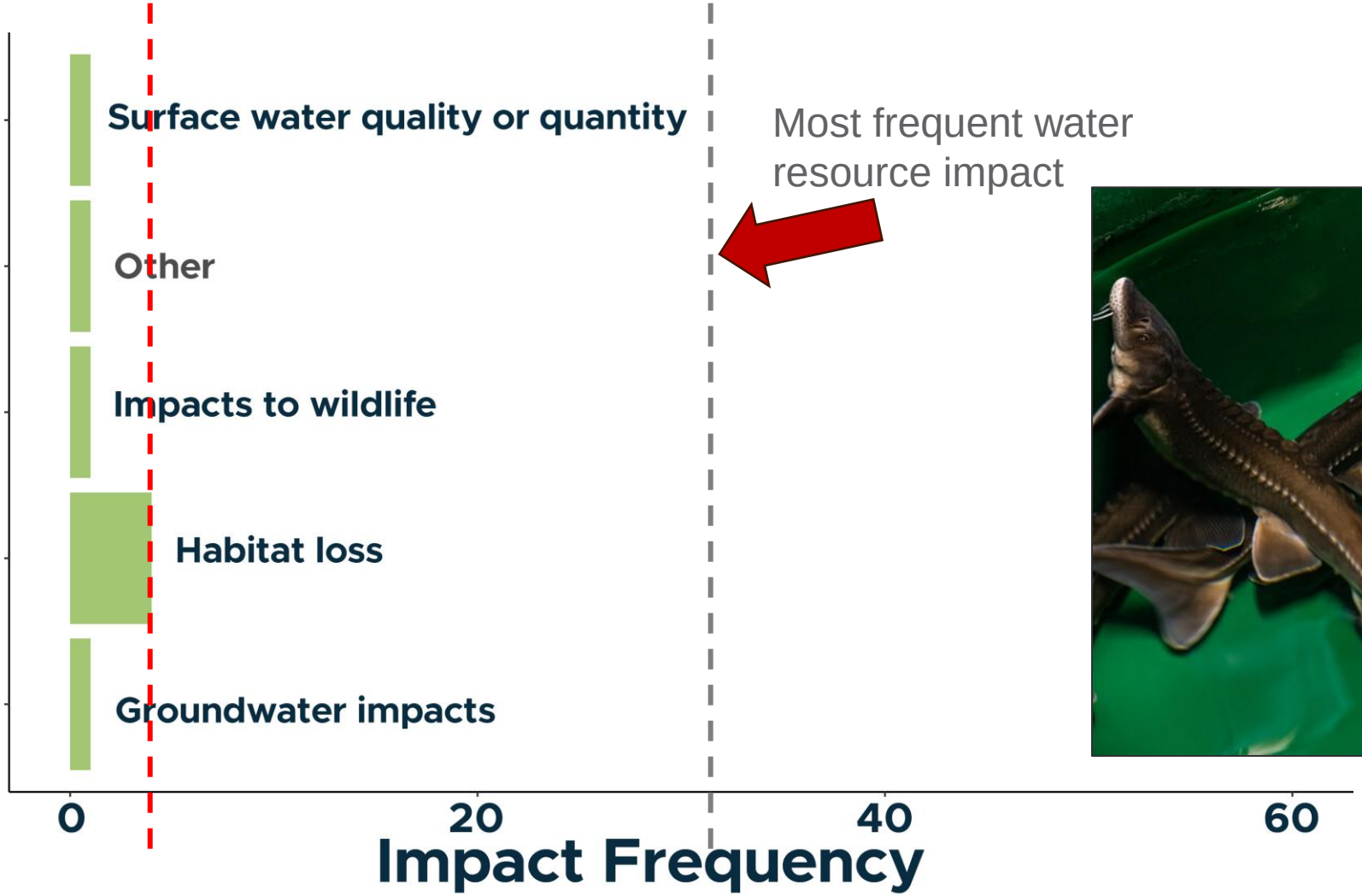
*We use term “mitigations” because that is language used in Environmental Impact Statements

Pracheil et al. *in revision.* Environmental impacts of closed-loop pumped storage hydropower. PNNL HydroWIRES report.

Water resource impacts and corresponding mitigation examples

- Potential biofouling of reservoir
  - *Water treatment to control algae growth as needed*
- Potential impacts to irrigation
  - *Schedule irrigation ditch interconnection to new irrigation water conveyance system that will provide water for facility during non-irrigation season to prevent harm to Lost River and shortnose suckers*
- Groundwater withdrawals from shallow and deep aquifers for initial filling
  - *Withdrawals from shallow aquifers could impact other users so make-up water for ongoing project operation will only be drawn from deep aquifers*
- Leakage from project into our out of project structures
  - *Underground powerhouse and all water conveyance tunnels would be fully lined and would not allow leakage either into or out of the project structures*
- Stormwater inflow during large rainfall events could cause either reservoir to overflow
  - *For larger inflow volumes, lower reservoir spillway would be operated to release extra water in storage.*

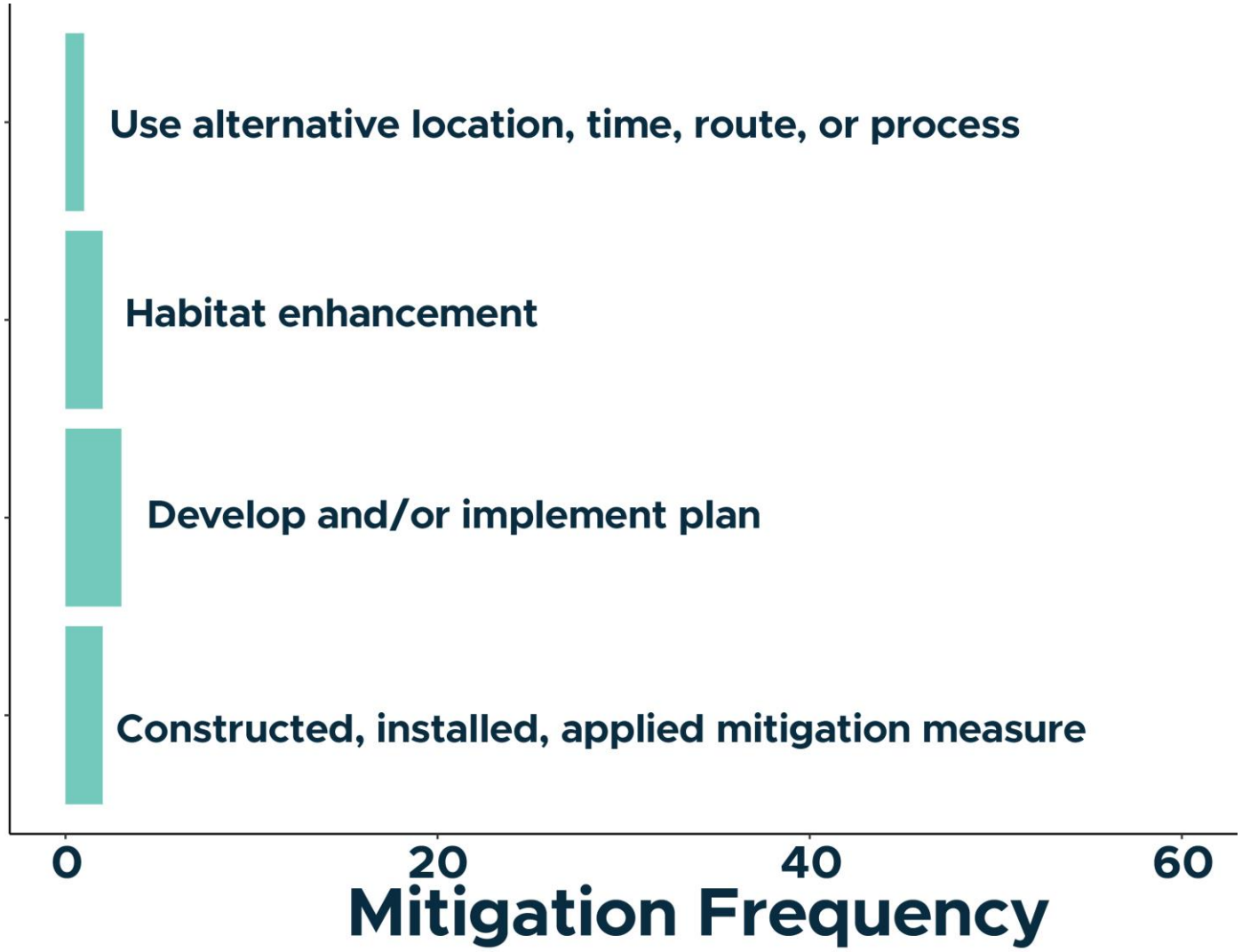
Many fewer fisheries and aquatic ecology impacts compared to water resource impacts



Most frequent water resource impact

Pracheil et al. *in revision.* Environmental impacts of closed-loop pumped storage hydropower. PNNL HydroWIRES report.

Fisheries and aquatic ecology mitigations



Pracheil et al. *in revision.* Environmental impacts of closed-loop pumped storage hydropower. PNNL HydroWIRES report.

Aquatic ecology impacts and corresponding mitigation examples

- Changes in fish species composition due to habitat alteration
  - *Two ponds would be established and stocked in the project area to provide warmwater fish habitat*
- Elimination of 28.6 acres of wetlands/riparian habitat
  - *Applicant would replace one-to-one in-kind 11 ac of wetlands identified on the National Wetlands Inventory maps that would be eliminated during construction of the upper reservoir. The wetland mitigation site would not include the two one-acre ponds providing warmwater fish habitat. However, sixty percent of the open water would be three feet deep or less to provide emergent wetland habitat. The applicant would plant willows and cottonwoods along the diversion channel.*
- Water level fluctuations could increase potential for invasive species
  - *Implement Invasive Species Additional Studies or Monitoring and Control Plan*
- Impacts to amphibians
  - *Enact Predator Monitoring and Control Plan*

HydroWIRES Resources

U.S. DEPARTMENT OF ENERGY

- B.M. Pracheil, K.P. Duffy, L. Zeng, J.W. Saulsbury. *In revision*. Environmental Impacts of Closed-Loop Pumped Storage Hydropower.

- Environmental Impact Statements (EIS):
  - Summit Final EIS. P-9423. January 1991. (Not available online)
  - Lorella Draft EIS. P-11181. April 1994. (Not available online)
  - Eagle Mountain Final EIS. P-12635. July 2014.
  - Swan Lake Final EIS. P-13318. April 2019.
  - Gordon Butte Final EIS. P-13642. December 2016.
  - Mineville Draft EIS. P-11858. June 2019.

- PNNL Hydropower eLibrary

Questions?

Brenda Pracheil, Ph.D.
Fisheries Biologist
Pacific Northwest National Laboratory
brenda.pracheil@pnnl.gov
+1 (509) 372-4983

Characteristics of closed-loop PSH EISs reviewed

FERC #	Project Name	State	Project Active?	Project MW	EIS date	License Issue Date	Termination Date
P-9423	Summit Pumped Storage Hydroelectric Project	OH	No	1500	1/1991	4/12/1991	4/12/2001
P-11181	Lorella Dam	OR	No	1000	4/1994	NA	10/12/1998
P-11858	Mineville Energy Storage Project	NY	No	240	6/2019	NA	12/11/2020
P-12635	Eagle Mountain Pumped Storage Project	CA	Yes	1300	1/2012	7/21/2014	Active license
P-13318	Swan Lake North Pumped Storage Project	OR	Yes	393	1/2019	4/30/2019	Active license
P-13642	Gordon Butte	MT	Yes	400	9/2016	12/14/2016	Active license

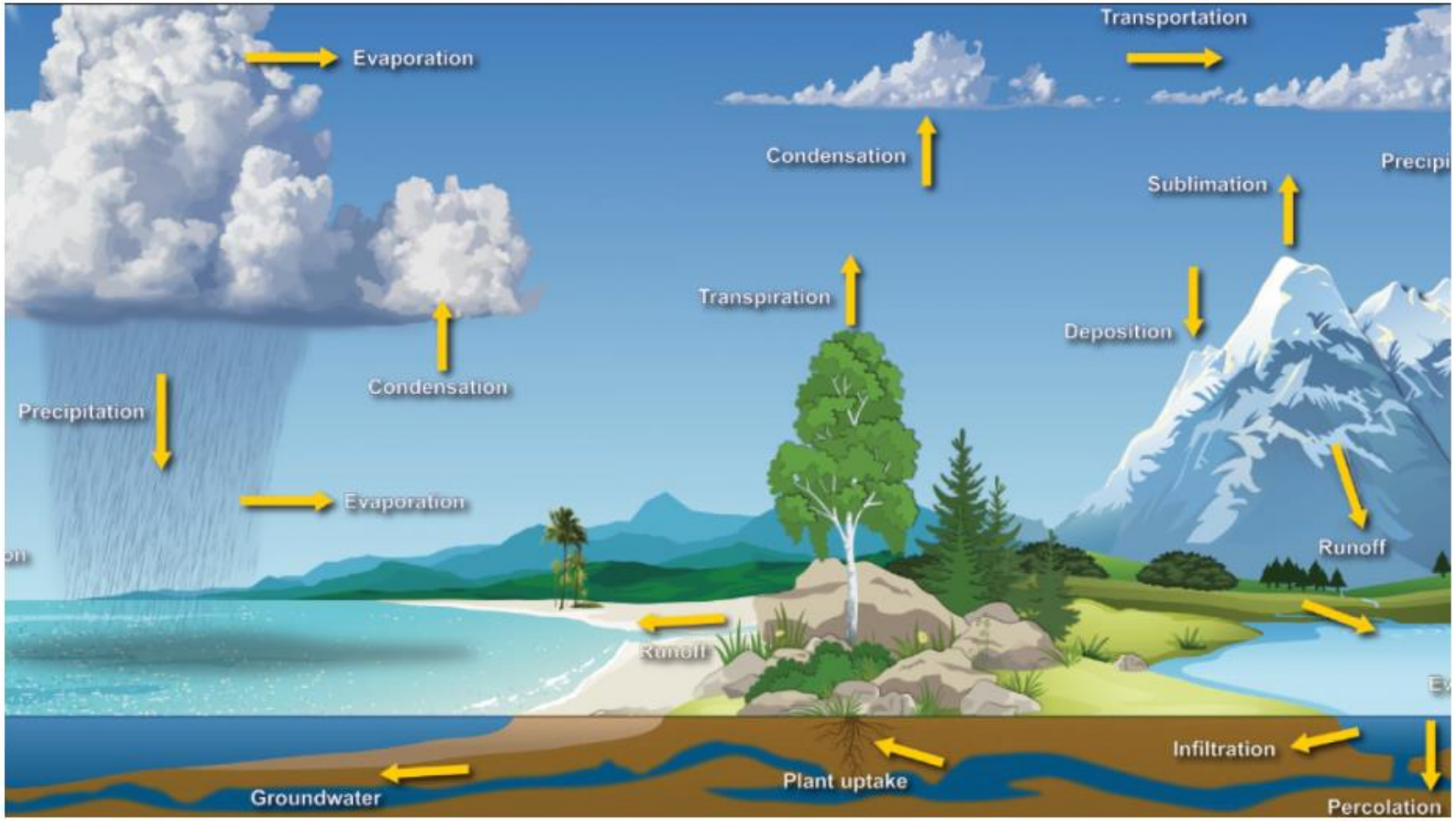
Water Availability and Pumped Storage Hydropower

Megan Kernan
Energy, Water, and Major Projects Division
Washington State Department of Fish and Wildlife

Quick presentation overview

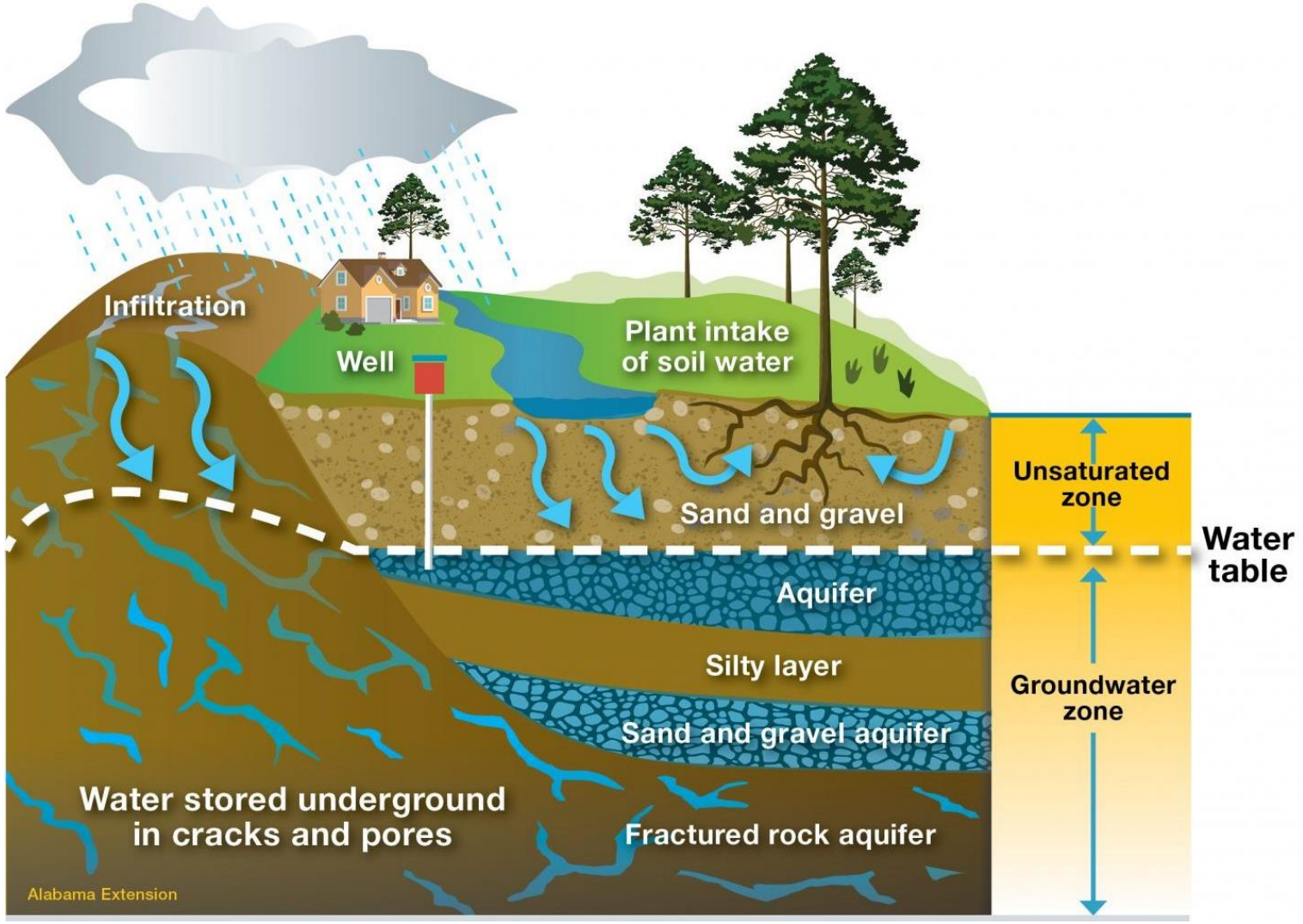
- Hydrologic cycle and groundwater
- Western water law and water rights
- Instream flow rules and considerations for aquatic species
- Pathways to acquire water in WA
- Questions

Hydrologic cycle



The water cycle. (Image credit: Dennis Cain/NWS)

Groundwater and aquifers

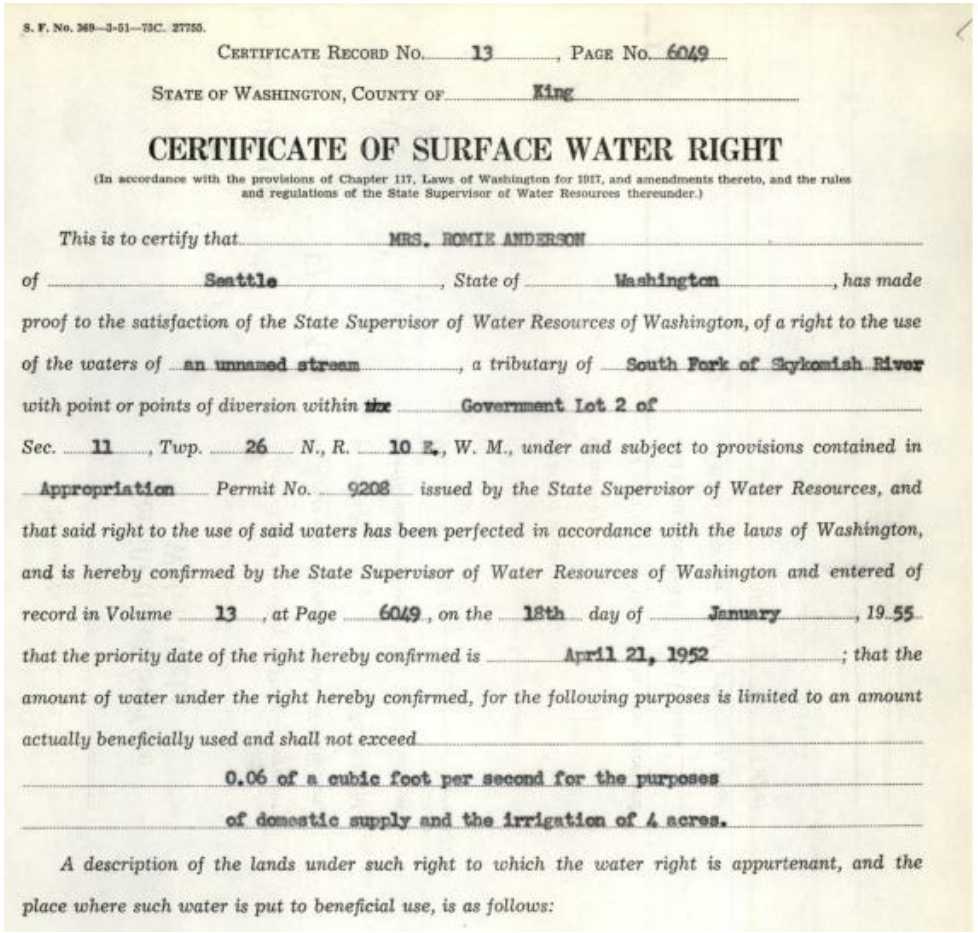


Western water law

- Prior Appropriation: first in time, first in right
- Continuous, beneficial use is the measure of right
- Water rights are (generally) appurtenant to land
- Private property interest/usufructuary

Water rights

- Administered by WA Dept. of Ecology
- Specify quantity, place, use, timing
- Surface water diversions or groundwater withdrawals
- Subject to relinquishment
- Some uses "permit-exempt"
- Reservoir rights



S. F. No. 369—3-51—75C. 27755.

CERTIFICATE RECORD NO. 13, PAGE NO. 6049

STATE OF WASHINGTON, COUNTY OF King

CERTIFICATE OF SURFACE WATER RIGHT

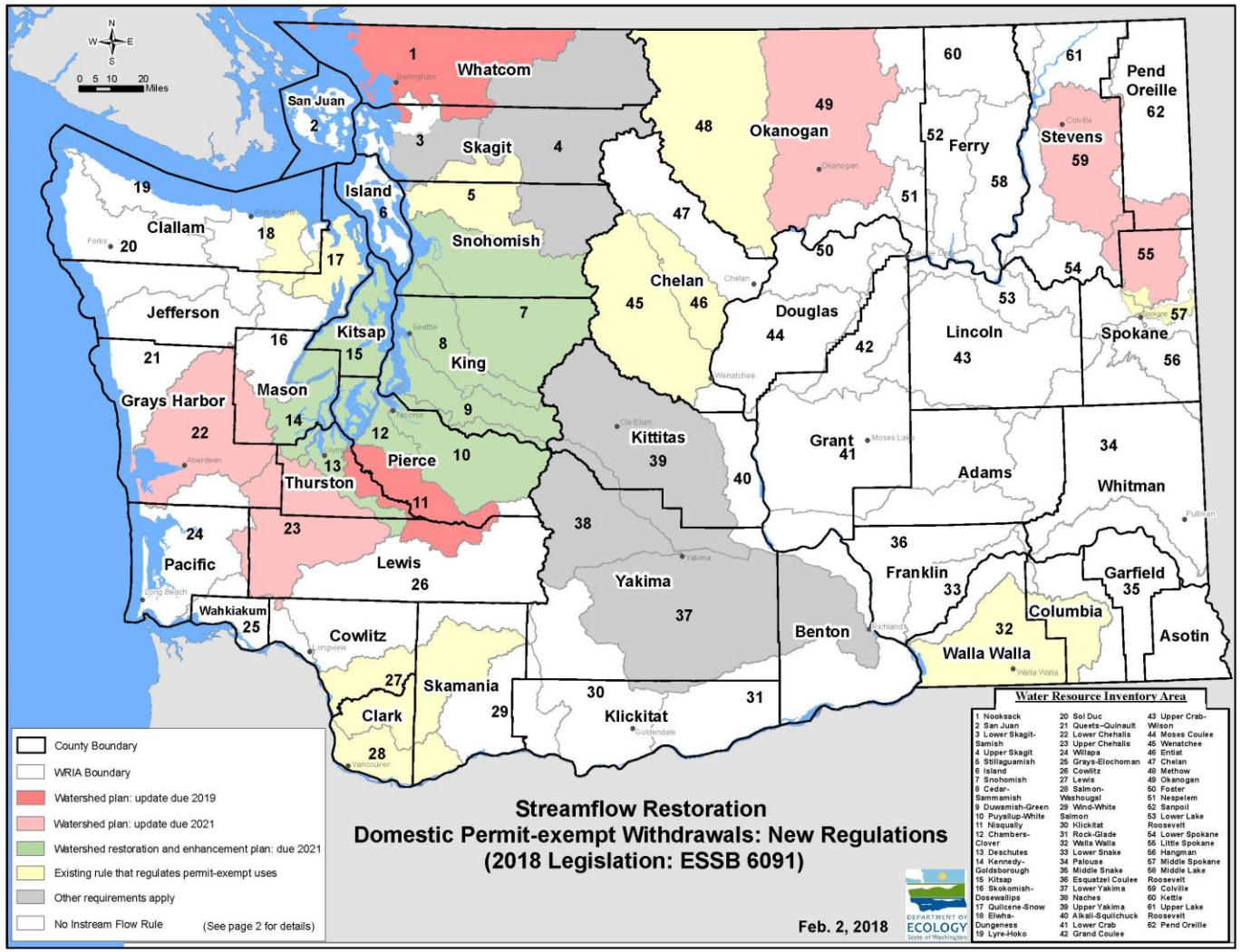
(In accordance with the provisions of Chapter 117, Laws of Washington for 1917, and amendments thereto, and the rules and regulations of the State Supervisor of Water Resources thereunder.)

This is to certify that MRS. ROMIE ANDERSON *of* Seattle, *State of* Washington, *has made proof to the satisfaction of the State Supervisor of Water Resources of Washington, of a right to the use of the waters of* an unnamed stream, *a tributary of* South Fork of Skykomish River *with point or points of diversion within* ~~the~~ Government Lot 2 of *Sec.* 11, *Twp.* 26 *N., R.* 10 E., *W. M., under and subject to provisions contained in* Appropriation *Permit No.* 9208 *issued by the State Supervisor of Water Resources, and that said right to the use of said waters has been perfected in accordance with the laws of Washington, and is hereby confirmed by the State Supervisor of Water Resources of Washington and entered of record in Volume* 13, *at Page* 6049, *on the* 18th *day of* January, *19*55 *that the priority date of the right hereby confirmed is* April 21, 1952; *that the amount of water under the right hereby confirmed, for the following purposes is limited to an amount actually beneficially used and shall not exceed*

0.06 of a cubic foot per second for the purposes of domestic supply and the irrigation of 4 acres.

A description of the lands under such right to which the water right is appurtenant, and the place where such water is put to beneficial use, is as follows:

Instream flow rules



How projects get water?

- New water right: four-part test
- Transactions
- Municipal water
- Mitigation/water banking

Questions?

Megan.Kernan@dfw.wa.gov

Break

Returning at 1:10 PM

Discussion of Water Issues
Breakout Sessions

Breakout Sessions

- Two rounds of 30-minute facilitated discussions with four breakout groups each round
- Two topics:
  - Water Quality & Aquatic Ecosystems
  - Water Quantity
- Choose where you would like to go—but we encourage you to switch topics in the second round!
- Depending on group size, we may split into additional breakout groups

Breakout Session Discussions

- *What are potential effects of PSH (positive or negative) that you care most about?*
- *What areas or geographic features should PSH siting emphasize or avoid to enhance opportunities and reduce impacts?*
- *What should PSH projects do to improve outcomes with respect to water issues?*

- We'll start with individual brainstorming on a virtual white board (Mural)
- Then, we'll discuss topics of most interest

Back to Mural!

- Click on the Mural link in Zoom chat or copy and paste it into an internet browser
- Keep Zoom and Mural open simultaneously
- Add your name (or remain anonymous) & click “Enter as a visitor”

Breakout Sessions, Round 1

Returning around 1:45 PM

Breakout Sessions, Round 2

Returning around 2:15 PM

Quick Highlights from Breakout Sessions

Next Steps and Wrap up

Karen Janowitz, WSU Energy Program

Future Statewide Online Public Meetings

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- October 30
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  - Air quality, greenhouse gas emissions
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PSH Siting Study Meeting Webpage:

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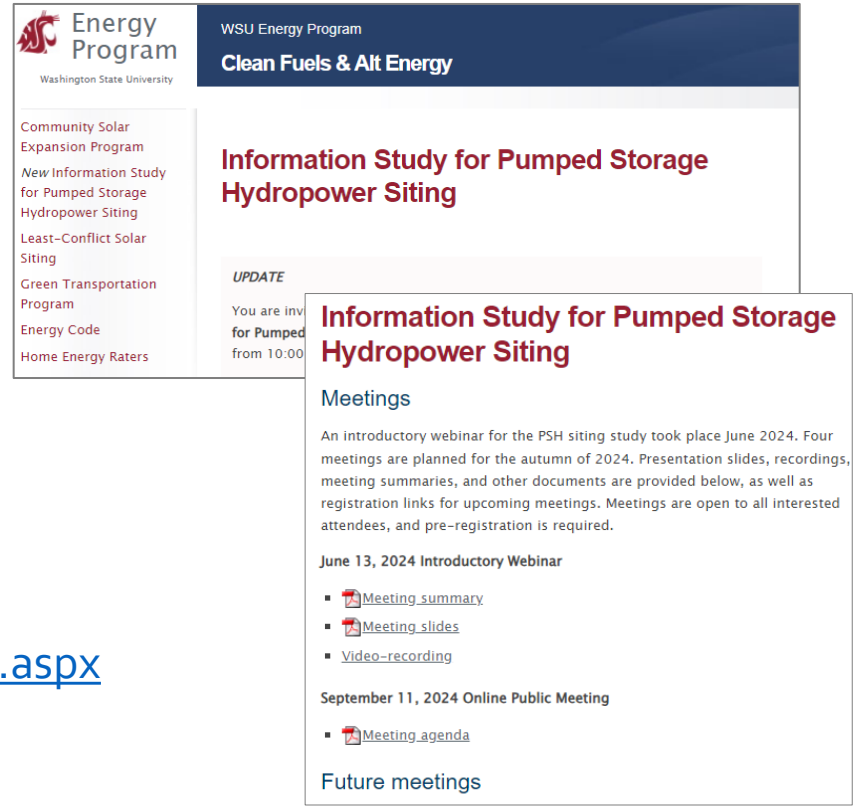

Sign up for the email distribution list:
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Karen Janowitz
janowitzk@energy.wsu.edu

Thank You!

Karen Janowitz and the PSH study team