

# Co-locating Marine Energy and Aquaculture

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Marine energy has the potential to power various aquaculture systems/operations, PNNL is conducting research to understand feasibility, fill knowledge gaps, and work towards demonstrations.

## BACKGROUND

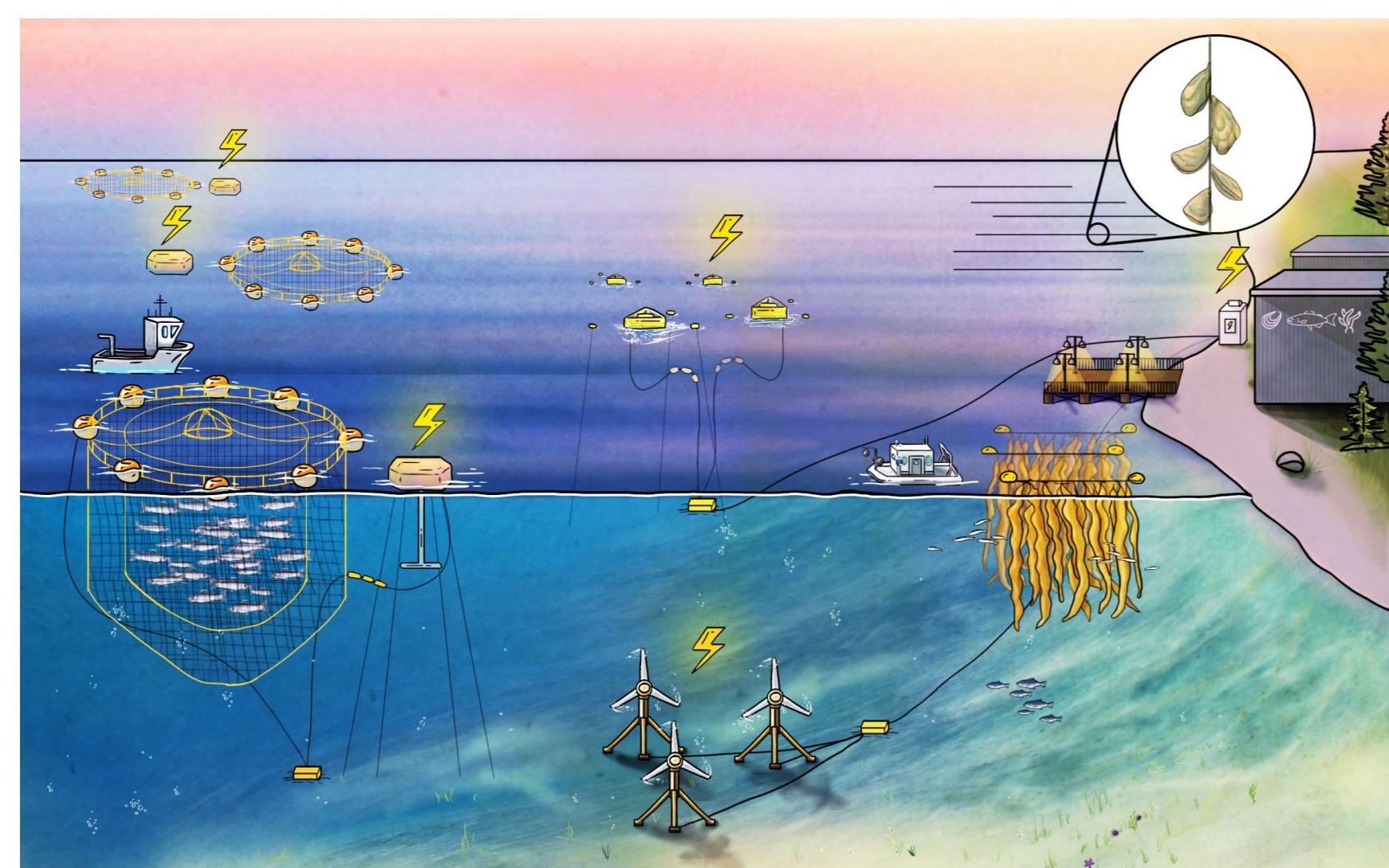


Figure 1. Depiction of aquaculture and marine energy co-location (Illustration by Stephanie King, PNNL).

PNNL is exploring the potential for co-locating marine energy and aquaculture.

This is part of the Powering the Blue Economy initiative which seeks to understand the power needs of existing or emerging maritime markets and advance technologies that could integrate marine energy to relieve power constraints and enable growth.

Three projects are exploring offshore, community-scale, and nearshore opportunities for co-location.



Figure 2. Co-located aquaculture and renewable energy deployments or research projects around the world (figure adapted from Freeman et al. 2022).

## OFFSHORE

**Goal:** Investigate the feasibility of and opportunities for co-locating offshore aquaculture and wave energy in Puerto Rico.

### Spatial Analysis

Identify key parameters for offshore aquaculture and wave energy and conduct a spatial analysis to find suitable areas for co-location.

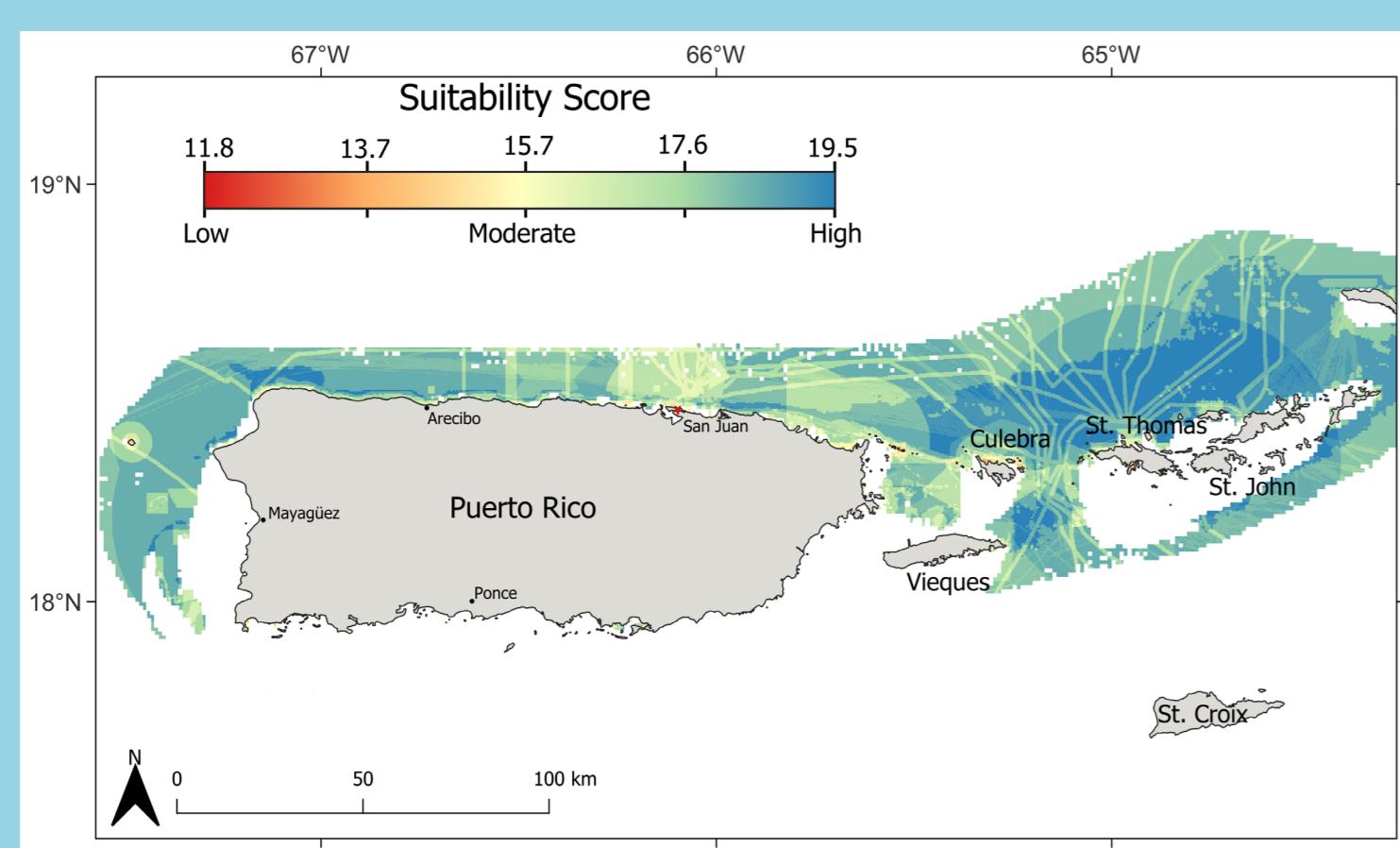


Figure 3. Suitability map of potential locations for co-location of wave energy and offshore aquaculture.

### Environmental Monitoring

Conduct fieldwork to develop monitoring methods for co-location, gather local data, and inform future efforts.

### Outreach & Engagement

Engage stakeholders to receive feedback and incorporate local perspectives and opinions, needs, and knowledge.

## COMMUNITY-SCALE

**Goal:** Assess the potential for wave or tidal energy to power community-scale aquaculture in the Salish Sea.

### Energy Assessment

Assess energy needs of the Jamestown S'Klallam Tribe's (JST) aquaculture operations in WA and HI.



Figure 4. Sablefish net pen at JST aquaculture facility.

### Spatial Analysis

Identify key parameters for aquaculture and marine energy in the Salish Sea. Assess if marine energy resources align with current JST facilities and for future co-location opportunities.

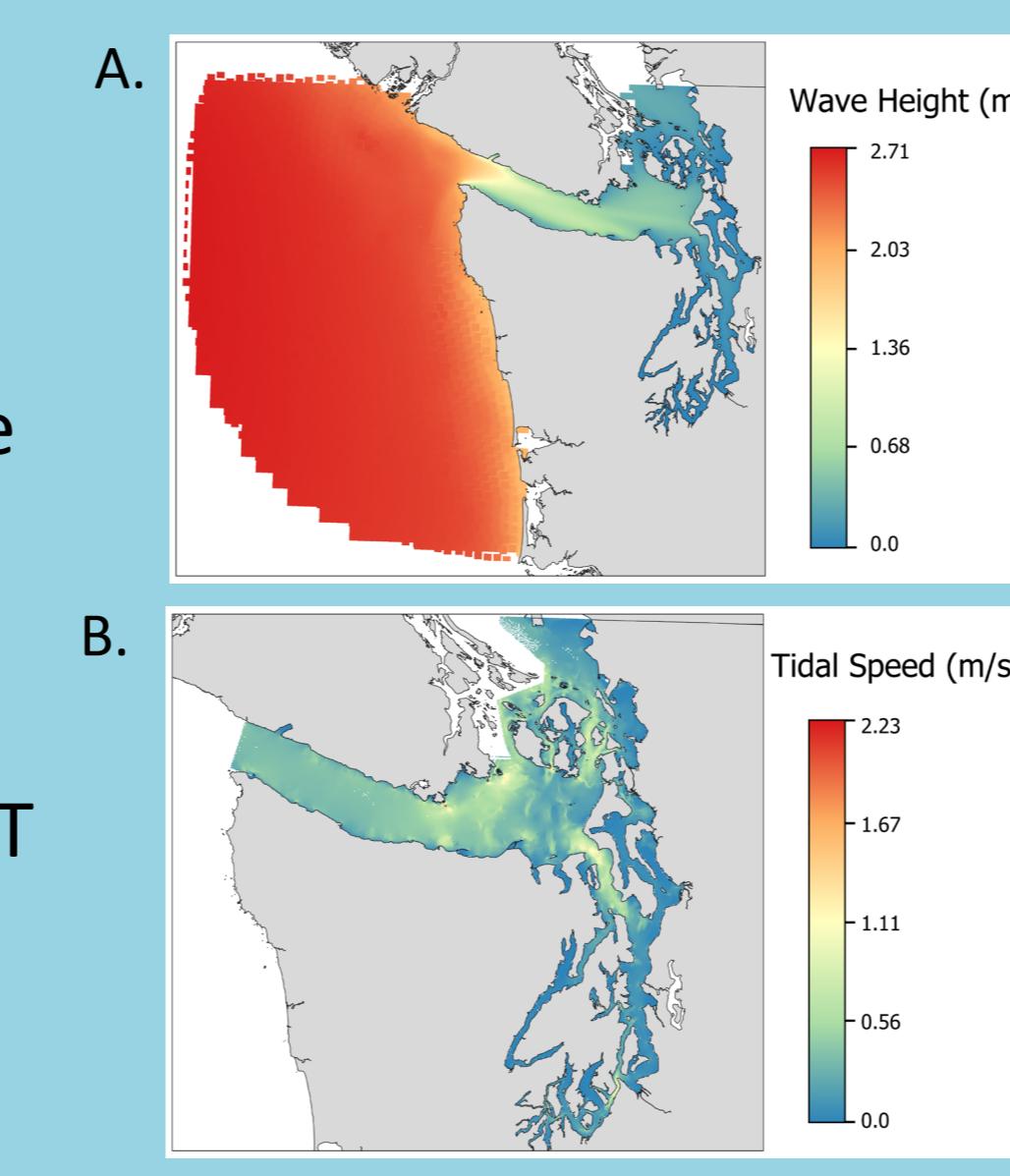


Figure 5. Wave height (A) and tidal speed (B) in the study area.

### Outreach & Engagement

Collaborate with JST to develop educational material and engage with the aquaculture community regarding the use of marine energy for aquaculture.

## NEARSHORE

**Goal:** Investigate the feasibility of tidal current energy technologies to power aquaculture operations at nearshore kelp and oyster farms.

### Energy Assessment

Understand power needs through literature review, discussion with partner farms, and electricity bills.



Figure 6. Floating upweller system at Hog Island Oyster Co.

### Characterize Nearshore Farms

Measure current speeds using acoustic doppler current profiler (ADCP) to identify viable tidal resources.



Figure 7. Nortek ADCP used to measure currents.

### Evaluate Low-Velocity Technology

Test VIVACE (vortex induced vibration) low-velocity technology to evaluate its potential to support power needs.

### Outreach & Engagement

Develop elementary age workbooks for education on marine energy and aquaculture. Create simulated kelp growth experiment for the classroom.

Together these projects are:

- Developing a diverse set of pathways for marine energy use with aquaculture.
- Working to foster economic, social, and environmental goals by leveraging the immense power of the oceans.

## IMPACT

- Supporting communities and marine life while exploring the potential to sustainably power the blue economy through research, collaboration, and outreach and engagement.

