Pacific Northwest NATIONAL LABORATORY

U.S. DEPARTMENT OF ENERGY | Office of ENERGY EFFICIENCY & RENEWABLE ENERGY
WATER POWER TECHNOLOGIES OFFICE

TRITON

# Triton Initiative

*Reducing barriers for marine energy through environmental monitoring technology development and testing*

PI: Joe Haxel
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U.S. DEPARTMENT OF ENERGY BATTELLE

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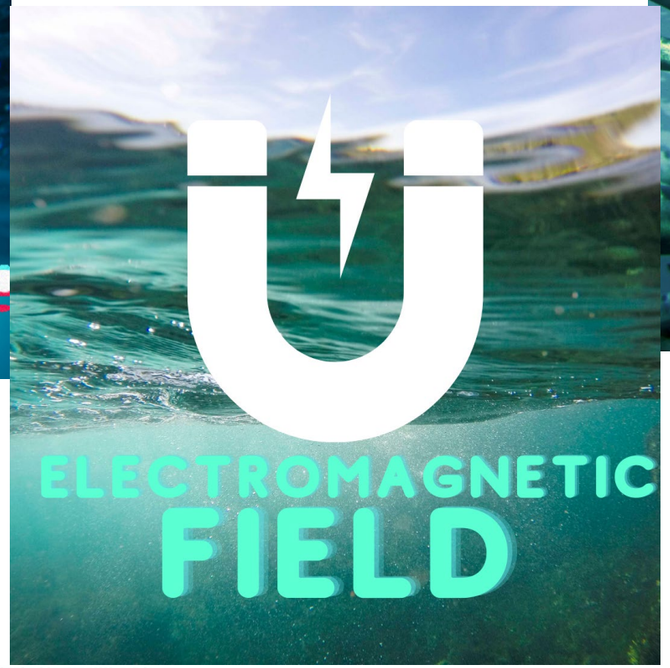
*The **Triton Initiative** supports industry partners, innovates technology, and performs tests to develop consistent, standardized methods for environmental monitoring around marine energy devices*

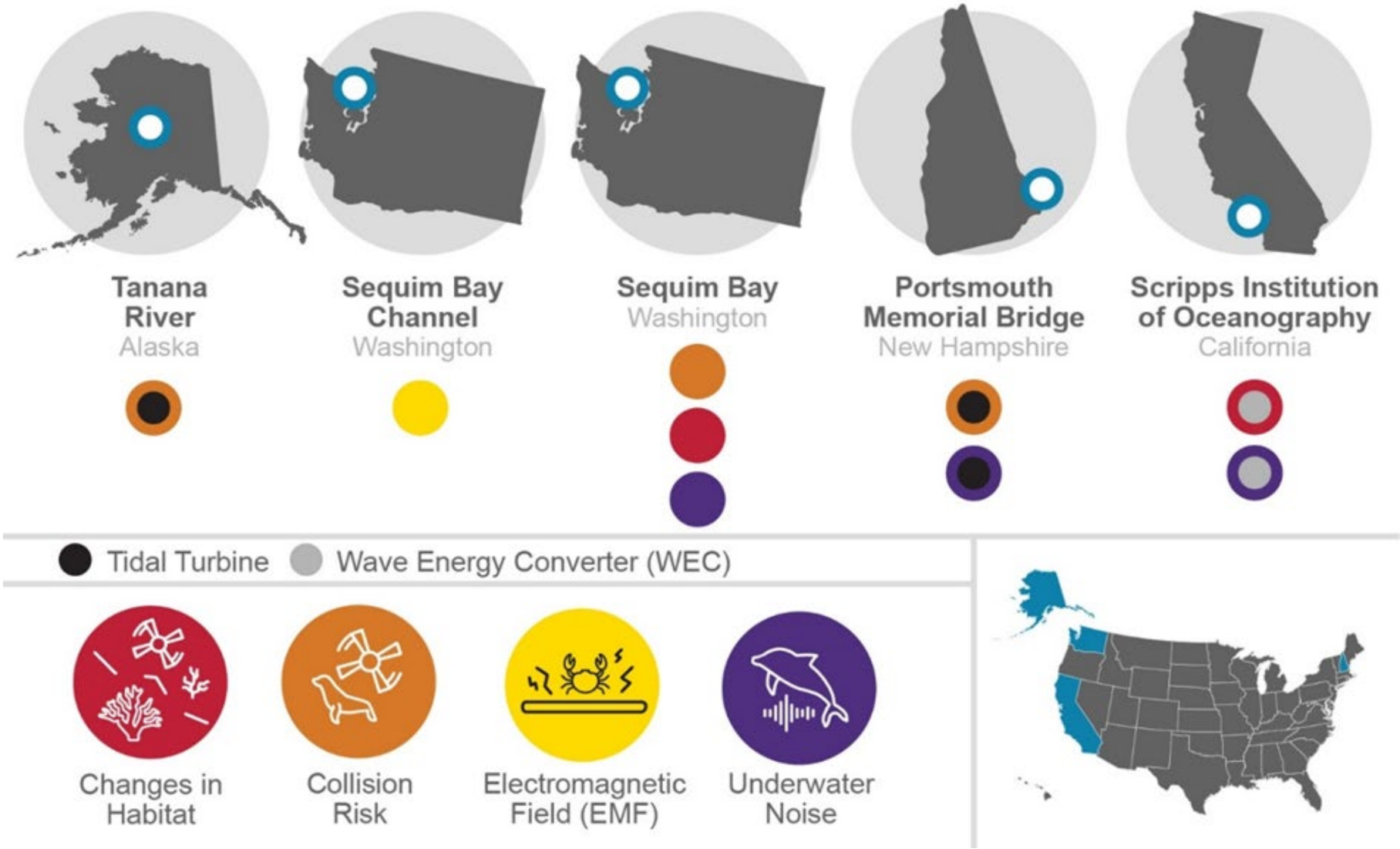
# Triton Field Trials (TFiT)

Four stressor areas the Triton team focused field research to create industry recommendations



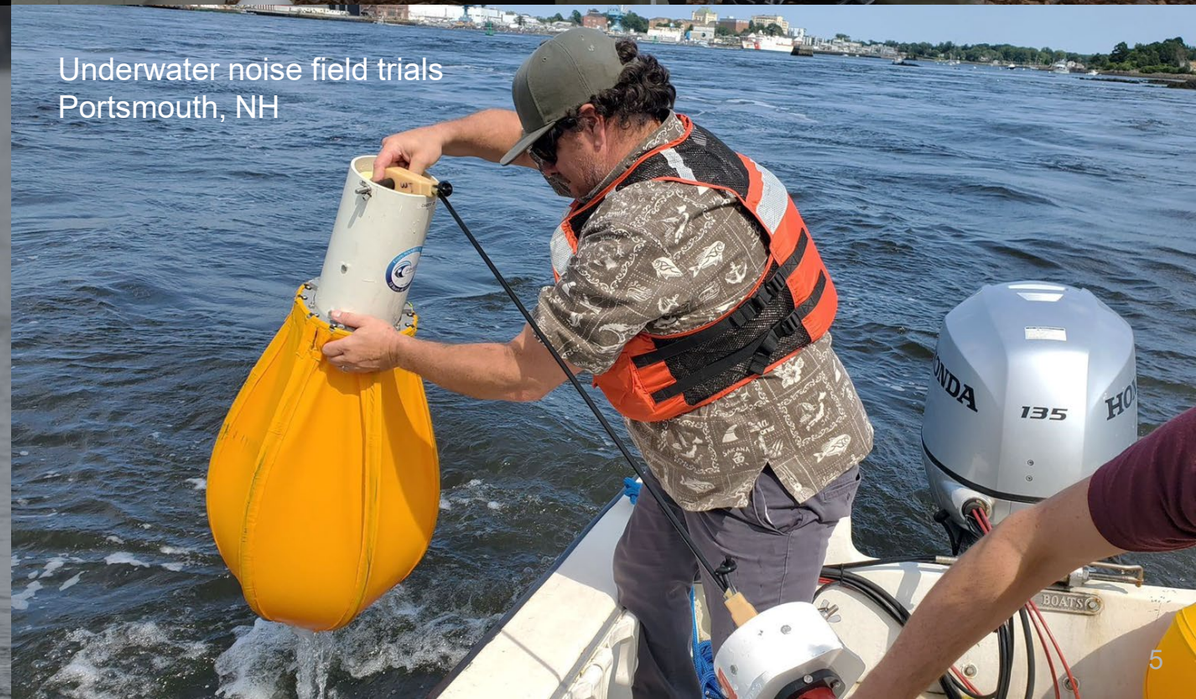
# Triton Field Trials (TFiT)



Changes in habitat field trials
La Jolla, CA

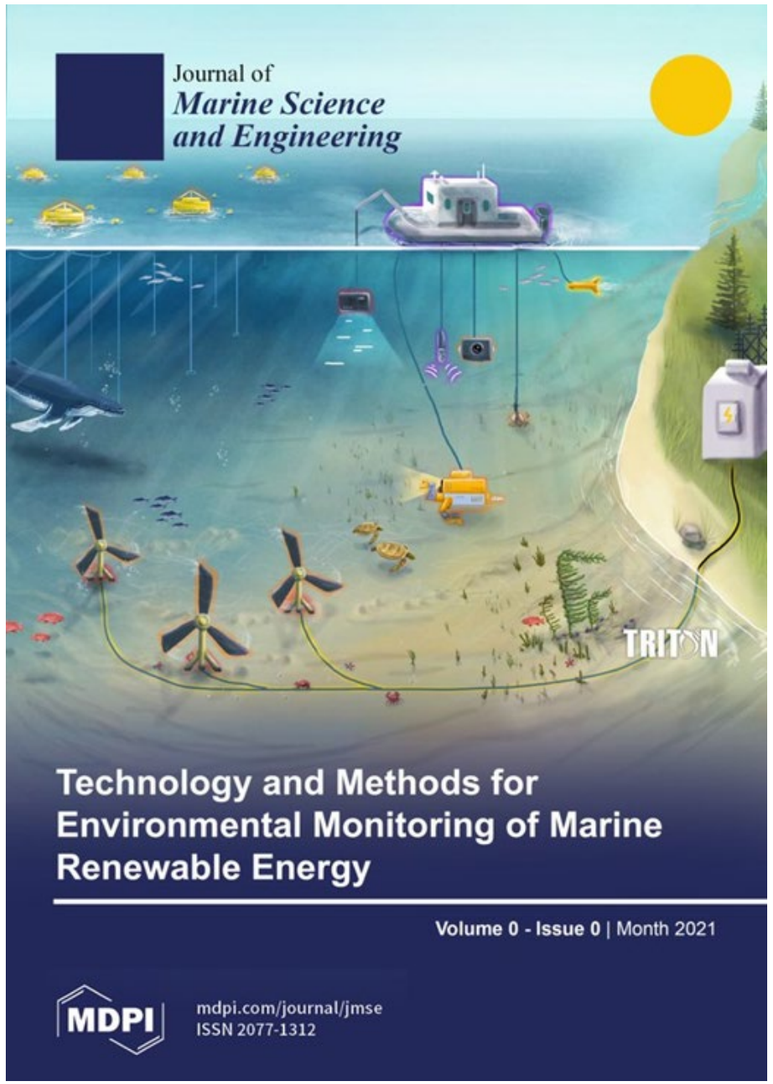
Collision risk technology tests
Sequim, WA

EMF field trials
Sequim Bay, WA



Underwater noise field trials
Portsmouth, NH

# Triton Field Trials (TFiT)




- Successful technology field testing and validation
- Four field test papers
- Six literature reviews
- Culminating in 10-paper special issue in the open access Journal of Marine Science and Engineering

Special Issue: **Technology and Methods for Environmental Monitoring of Marine Renewable Energy**

https://bit.ly/JMSE-Triton-Special-Issue
or scan to view the special issue.

# Triton TFiT Webinars

- Monthly webinars hosted by Triton's TFiT Task Leads
- Dive into TFiT recommendations and JMSE special issue topics

**Kate Buenau**
Predictive Modeling

**Cailene Gunn**
Science Communication

**Molly Grear**
Electromagnetic Fields

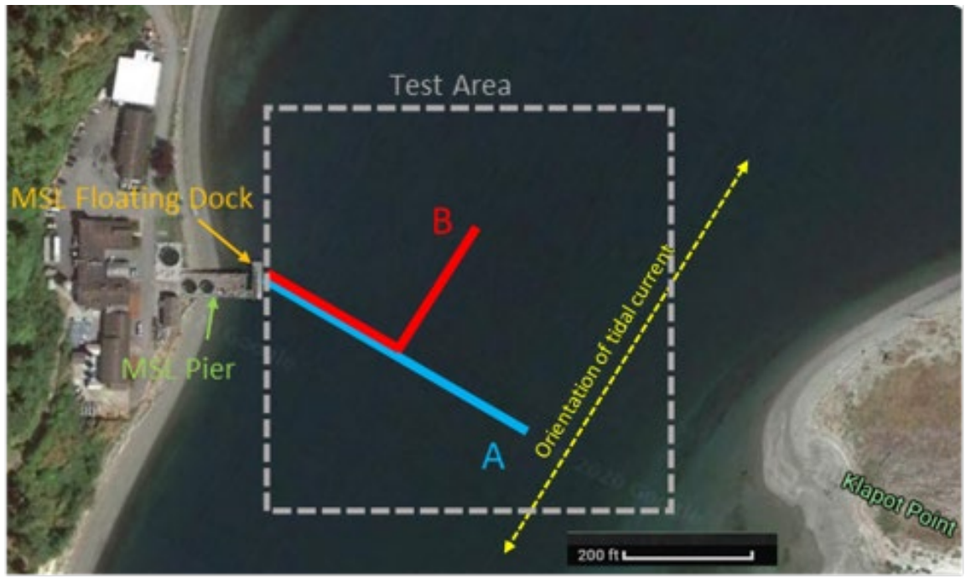
**Garrett Staines**
Collision Risk

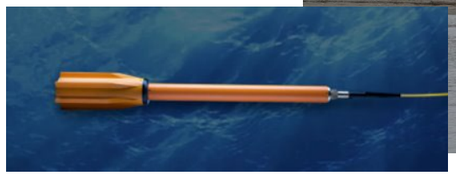
**Joe Haxel**
Underwater Noise

**Lenaig Hemery**
Changes in Habitat

# Electromagnetic Fields (EMF)

- Molly Grear, EMF task lead
- EMF is emitted from the cables that transmit electricity back to shore from marine energy developments
  - Concern that marine species may be sensitive to changes in the magnetic field, impacting their fecundity
  - Testing methods of measuring magnetic fields at a potential tidal energy site in Sequim Bay
  - Determined importance of understanding background magnetic field to characterize impact of energized cables



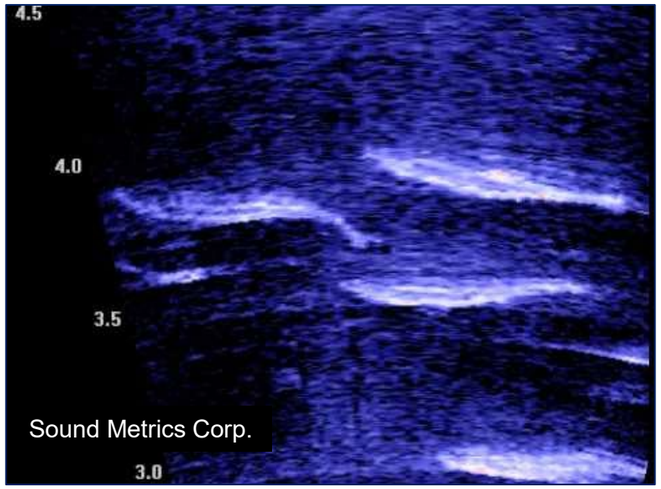
**Webinar available online:**
**https://bit.ly/Triton-Webinar-EMF**

# Collision Risk

- Garrett Staines, collision risk task lead
- Collision Risk
  - Concern of fish being struck by turbine blades
  - Observations in fast currents are challenging:
    - ✓ Video cameras for clear water
    - ✓ Acoustic cameras for turbid water
  - Tested ARIS 3000 acoustic camera in Tanana River, AK for salmon smolt interactions with small turbine

**Webinar available online:**
**https://bit.ly/Triton-Webinar-CollisionRisk**



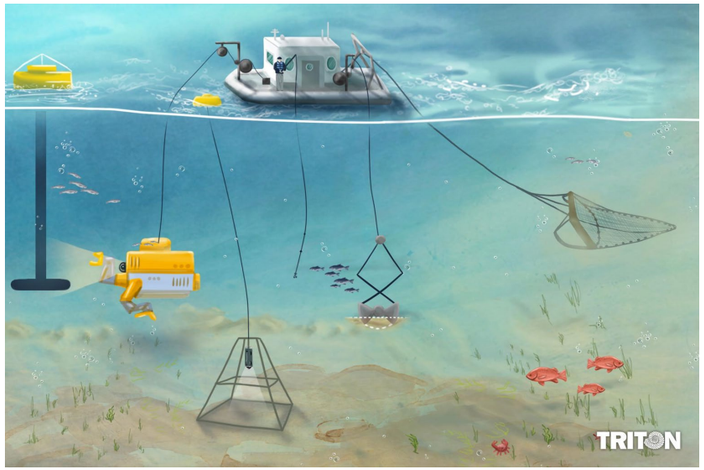
# Monitoring Underwater Noise

- Joe Haxel, underwater noise task lead and Triton PI
- *Stressor:* Underwater noise from marine energy devices could disturb marine mammals, fish, and invertebrates
- *Approach:*
  - IEC TS 62600 –40
    - Acoustic Characterization of Marine Energy Converters
  - Use Case
    - tidal turbine
    - drifting hydrophone

**Webinar available online:**
**https://bit.ly/Triton-Webinar-UnderwaterNoise**

# Monitoring Changes in Habitat (CiH)

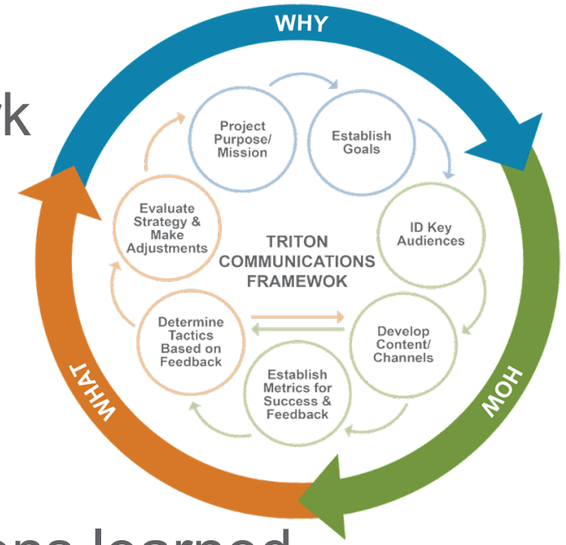
- Lenaïg Hemery, CiH task lead
- *Goal:* Identify sampling technologies that will bring the most consistent results for monitoring changes in habitat within marine systems where marine energy devices are deployed
- *Approach:*
  - Discuss with subject matter experts
  - In-depth literature review of technologies
  - Identify technologies best suited for ME context
  - Test 360-degree camera at wave energy site for monitoring artificial reef effect of anchors
  - Make recommendations on technologies to use



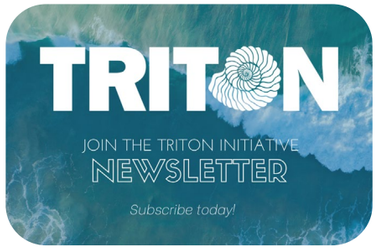

**Webinar available online:**
**https://bit.ly/triton-talks-changes-in-habitat-and-sustainability**

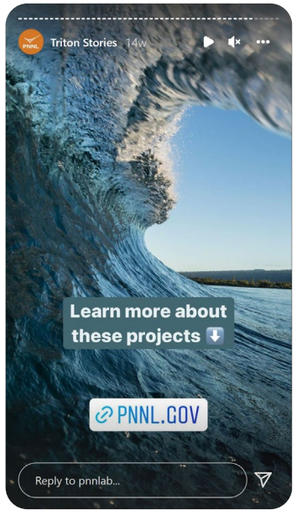
# Science Communication

- Cailene Gunn, communications task lead
- *Goal:* to use communications, outreach, and engagement to support the project mission
- *Approach:* Implementation of Triton's communications framework
  - Website
  - Webinars
  - Social media
  - Newsletter
  - Triton Stories
- Most effective strategies and lessons learned








**Webinar available online:**
**https://bit.ly/Triton-Webinar-ScienceCommunication**

# Current research focused on animal interactions with ME devices and associated stressors

**Tethered Balloon System (TBS):** partnership with Sandia NL to monitor wildlife interactions with ME devices using a diverse optical and thermal payload

**Probability of Encounter Model (PoEM):** collect smolt outmigration data to develop a probability model that informs collision risk for fish with current energy converters

**Acoustic Particle Motion (PM) and Substrate Vibration:** researching underwater noise effects for fish and invertebrates

**Flow Noise (FN):** research flow noise mitigation strategies to improve acoustic sensor measurements in energetic ME environments

# To find out more

- Visit our website *pnnl.gov/projects/triton*
- Subscribe to the monthly newsletter at *bit.ly/PNNLTritonNewsletter*
- Read the monthly Triton Stories Blog at *pnnl.gov/projects/triton/stories*
- E-mail us at TritonMRE@pnnl.gov

## Triton Stories Blog

*read about the people behind the projects*