



Linking **LAND, SEA,** and **SOCIETY**  
THROUGH INTEGRATIVE COASTAL RESEARCH

## 2021 REPORT: *Growing the mission*



The Alaska Coastal Rainforest Center builds partnerships and catalyzes collaborative ecological, economic, and social research in the north Pacific Coastal Temperate Rainforest (PCTR) to support vibrant and resilient communities and ecosystems.





# GROWING THE MISSION

In the September 2020, ACRC held a strategic visioning session with our stakeholders, leadership, staff, and researchers to discuss our mission and future as an organization. Former ACRC director Allison Bidlack highlighted our trajectory from a small initiative to a thriving organization with research faculty, graduate students, postdoctoral researchers, technicians, and support staff.

We discussed how ACRC can build on existing collaborations and partnerships, strengthen our interdisciplinary approach, and better integrate with communities across the region. As a result, we are developing new research themes and partnerships to expand our mission.

## CLIMATE AND CARBON IN THE RAINFOREST

In North America's largest remaining temperate rainforest, coastal marine environments are intrinsically linked with the land through the delivery of organic matter and nutrients that are hypothesized to drive coastal ocean productivity. Coastal margins are a unique study area for scientists working to understand the ecological processes of coastal environments, and what they might look like in our changing climate.

ACRC-led research evaluates the land-to-ocean flow of carbon and nutrients in the PCTR, their influence on nearshore marine ecosystems, and how these connections are altered by climate change.

## Glacier retreat impacts carbon transport to the ocean

Glacial retreat is occurring rapidly in Southeast Alaska, and as a result, changing how carbon is produced, stored, and transported across the landscape. As glacier runoff is a significant source of carbon flowing to coastal waters in Southeast Alaska, glacial retreat will have an impact on carbon cycles in the region. A study of three watersheds in coastal Southeast Alaska that vary in glacier cover found that changes in glacier coverage will increase the transport of dissolved organic carbon in rivers and decrease the transport of particulate organic carbon to the coastal ocean.

## Storms drive carbon export from the Tongass

Rainstorms change the concentration and type of carbon transported by streams in the PCTR by reaching more soil carbon pools and creating different soil hydrologic pathways. An ACRC study explored the concentration, composition, and source of carbon over a storm event in Juneau and found that the dissolved organic carbon concentration in streams increased during the storm. Beyond that, a higher proportion of an energy-rich form of carbon was transported to coastal ecosystems, providing an energy subsidy to aquatic microbial communities.

## Changing hydrologic patterns affect stream nutrients and juvenile salmon growth

Though warmer and wetter years are predicted for Southeast Alaska, the implications for streamflow are not straightforward. Year-to-year variations in precipitation patterns can cause both drought as well as larger and more frequent storm events. Meanwhile, melting glaciers can supplement stream flows, until retreat becomes so advanced that glaciers may disappear from some watersheds completely.

Amid high and low flow, salmon persist in these waters as the landscape changes around them. ACRC graduate students Claire Delbecq and Kevin Fitzgerald are studying the flow of nutrients from land to sea, and how different hydrological patterns affect the growth of juvenile salmon, which is central to our understanding of their future survival.



LEARN MORE AT  
[ACRC.ALASKA.EDU](https://ACRC.ALASKA.EDU)



## CULTURAL LANDSCAPES OF GLACIER BAY NATIONAL PARK & PRESERVE

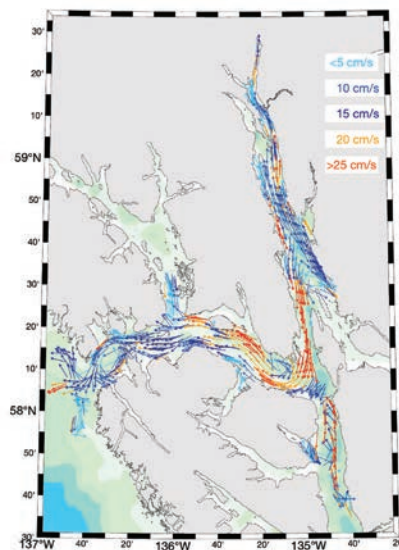
With anthropologists and members of the Yakutat Tlingit Tribe, ACRC director Tom Thornton is working to document Indigenous cultural landscapes in the greater northwestern portion of Glacier Bay National Park and Preserve and Tongass National Forest.

Featuring some of the most productive waters, distinctive glacial forelands and forests, and highest coastal mountains in the world, this massive watershed goes by at least two general names: 1) *Alséix* (Where it [Alsek River] Rests, referring to the lower river and its delta), and 2) *Gunaaxoo* (Among the Athapascans) indicating its role as a mixing zone for trade, travel, and habitation among the Tlingit and interior Athapascans. From an ecological point of view, it is a place of great biological productivity and diversity, with a host of microclimates as you move inland, upstream, and higher in montane elevation.

The original inhabitants of the region, now centered in Yakutat, Hoonah and elsewhere on the coast and interior, carry a rich history of events and continuing ties to the region. This project makes clear how these connections have evolved and been maintained over time and how other strained eco-cultural links can be enhanced or restored through collaborative stewardship.

### Tracking currents

ACRC is part of ongoing research with National Science Foundation Alaska EPSCoR to study the coastal margin ecosystem. In 2020, an effort to understand coastal ocean currents in Lynn Canal continued with monthly deployments of special buoys that track GPS locations and ocean temperature as they drift with the current. Twice a month, these buoys are deposited along a stretch of coast north of Juneau with large, kite-like attachments to catch the current. Scientists track the GPS coordinates in real time on an app, allowing them to create products like this map of the speed and direction of currents in Lynn Canal from drifters deployed in 2019 and 2020.



Credit: Mark Johnson, UAF

## ACRC RESEARCH AREAS

### OCEAN RESOURCES

- **Ocean Acidification:** ACRC is part of a collaborative effort with the Alaska Marine Highway System to monitor ocean acidification in southeast Alaska and British Columbia.
- **Food Security + Health:** ACRC works with Southeast Alaska Tribal Ocean Research on monitoring harmful algal blooms (HABs) that lead to paralytic shellfish toxins, as well as modeling future HAB dynamics as ocean temperatures rise.

### CULTURAL LANDSCAPES

Cultural Landscapes and seascapes are an important part of the PCTR system. They often align with significant areas of biodiversity, ecosystem services, as well as historic events, cultural values and lifeways. We work with local Tribes and agencies on documenting and stewarding cultural landscapes.

### GLACIER DYNAMICS

- **Glacial Landscapes:** We are part of a 5-year regional effort with Alaska EPSCoR to study the impacts of glacier runoff on nearshore marine ecosystems.
- **Outburst Floods:** ACRC works with partners to understand and predict glacial outburst floods in Suicide Basin near Juneau. Research on Suicide Basin aids the City of Juneau in emergency planning.

### COASTAL LINKAGES

ACRC is part of the NSF-funded Coastal Rainforest Margins Research Network, working across borders and disciplines to understand the processes that connect land and the highly productive coastal oceans along the PCTR, and how they are changing.

### STREAM DYNAMICS

- **Stream Flow:** ACRC monitors stream flow and develops storm event models to aid in infrastructure planning such as culvert design and hydropower development.
- **Stream Ecology:** We study stream chemistry, nutrient availability, and food web dynamics to assess water quality and inform fisheries management.

### ADAPTIVE GOVERNANCE

Adaptive governance provides a collaborative pathway that integrates science policy in decision-making focused on inclusiveness, innovation, and stewardship. ACRC researchers are working across the arctic and subarctic to understand how governments and communities are adapting to impacts from climate change, cruise ship tourism, and COVID-19.



# MEET ACRC

Tom Thornton, Director, Professor of Environment and Society  
Jason Fellman, Deputy Director, Research Assistant Professor  
Jim Powell, Research Assistant Professor  
Emily Whitney, Research Professional  
John Harley, Research Assistant Professor  
Leah Gregg, Administrative Specialist  
Molly Tankersley, Communication Specialist

## Affiliate Faculty:

Eran Hood, Professor of Environmental Science  
Sonia Nagorski, Associate Professor of Geology  
Jason Amundson, Associate Professor of Geophysics  
Julie Schram, Assistant Professor of Animal Physiology

Visit [acrc.alaska.edu](http://acrc.alaska.edu) for a complete, up-to-date list.

## Welcome our new director: Tom Thornton

ACRC welcomed Tom Thornton as ACRC Director in the spring of 2021. Thornton served as UAS Vice-Provost for Research and Dean of Arts and Sciences for several years and acted as Interim Co-Director of the Rainforest Center in late 2020, alongside Research Assistant Professor of Environmental Science Jason Fellman, who now serves as Deputy Director.



## ACRC BY THE NUMBERS

# \$6:1

For every dollar of state funding, ACRC brings in 5.7 dollars through competitive research grants and partnerships.

# 6

ACRC hosted or supported 4 undergraduate interns and 2 graduate students during the summer of 2021.

# 21

ACRC researchers and affiliates authored 21 peer reviewed publications over the 2020-2021 academic year.

## The Alaska Coastal Rainforest Center...

**THRIVES ON INTERDISCIPLINARY RESEARCH.** Our network of scientists collaborates across ecological, social, and political boundaries to answer wide-ranging questions about ecosystem function, climate adaptation, and resource management for coastal communities.

**EDUCATES, SUPPORTS AND INSPIRES YOUNG SCIENTISTS.** Through our unique agency-university partnership, we provide research and training opportunities for undergraduate, graduate, and postdoctoral scholars to learn and work in one of the most diverse and fascinating ecoregions in the world.

**MAKES CONNECTIONS FROM LAND TO SEA.** Water, carbon, and nutrients move between marine and terrestrial ecosystems in the northern Pacific coastal temperate rainforest at astounding rates. We study and model those interactions and the impact of a warming climate on ecosystems, lifeways, and sustainable economies in Southeast Alaska.

**CREATES ACTIONABLE SCIENCE PRODUCTS.** By working with communities, resource managers, tribal organizations, governments and NGOs, we create useable science products that aid in decision making around resource management, climate adaptation, and infrastructure.

**PROMOTES ECOSYSTEM STEWARDSHIP.** We strive to support ecosystem resilience and human well-being through informing management approaches in our coastal forest homeland.

**SUPPORT US!** Visit [engage.alaska.edu/uas/acrc](http://engage.alaska.edu/uas/acrc) to support research for resilient coastal ecosystems & communities.

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**AK CASE**  
Alaska Climate Adaptation Science Center



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