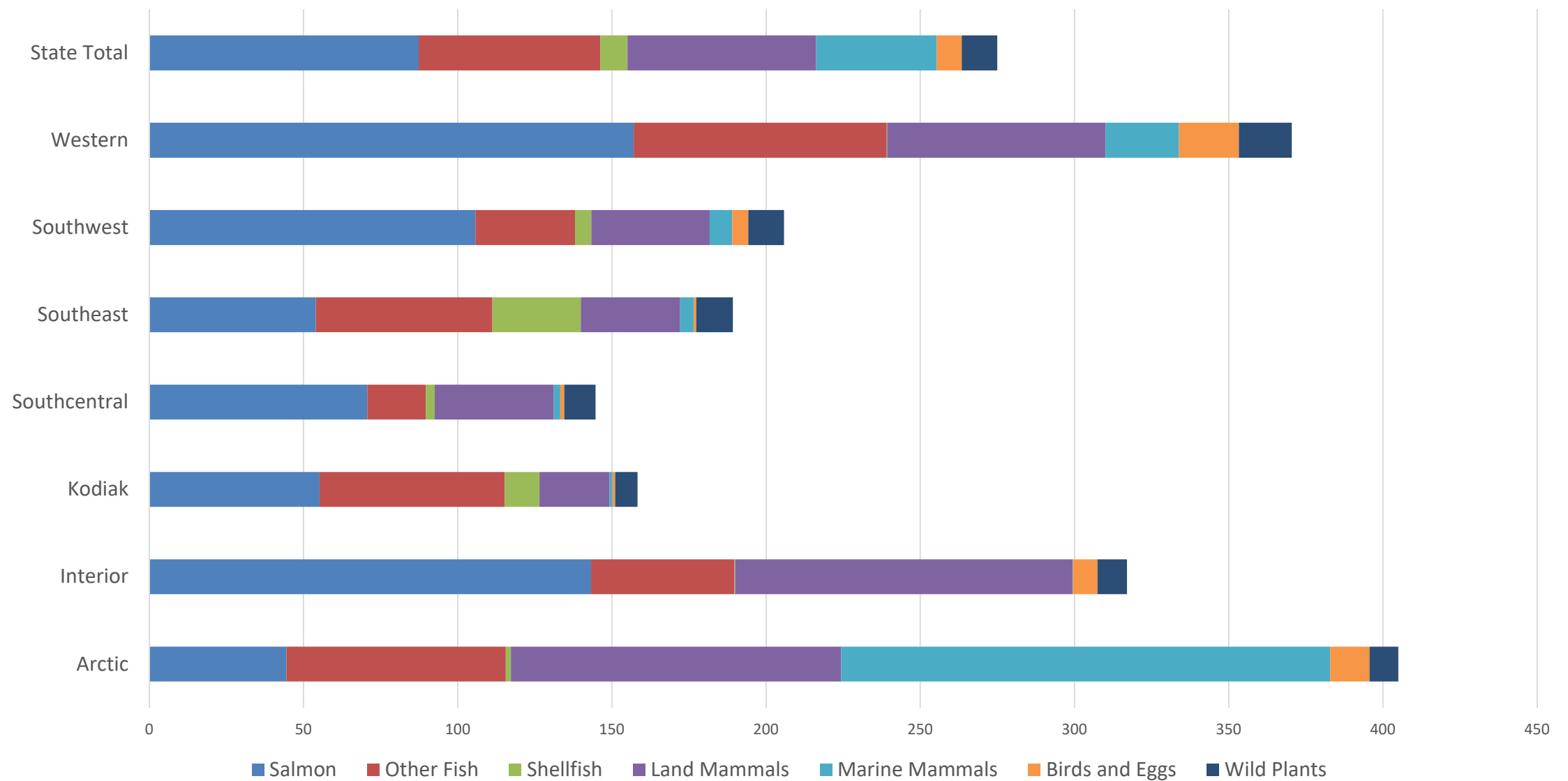


# CLIMATE IMPACTS TO SUBSISTENCE ECONOMIES & COMMUNITY AND REGIONAL ADAPTATION PLANNING

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INTERNATIONAL ARCTIC RESEARCH CENTER

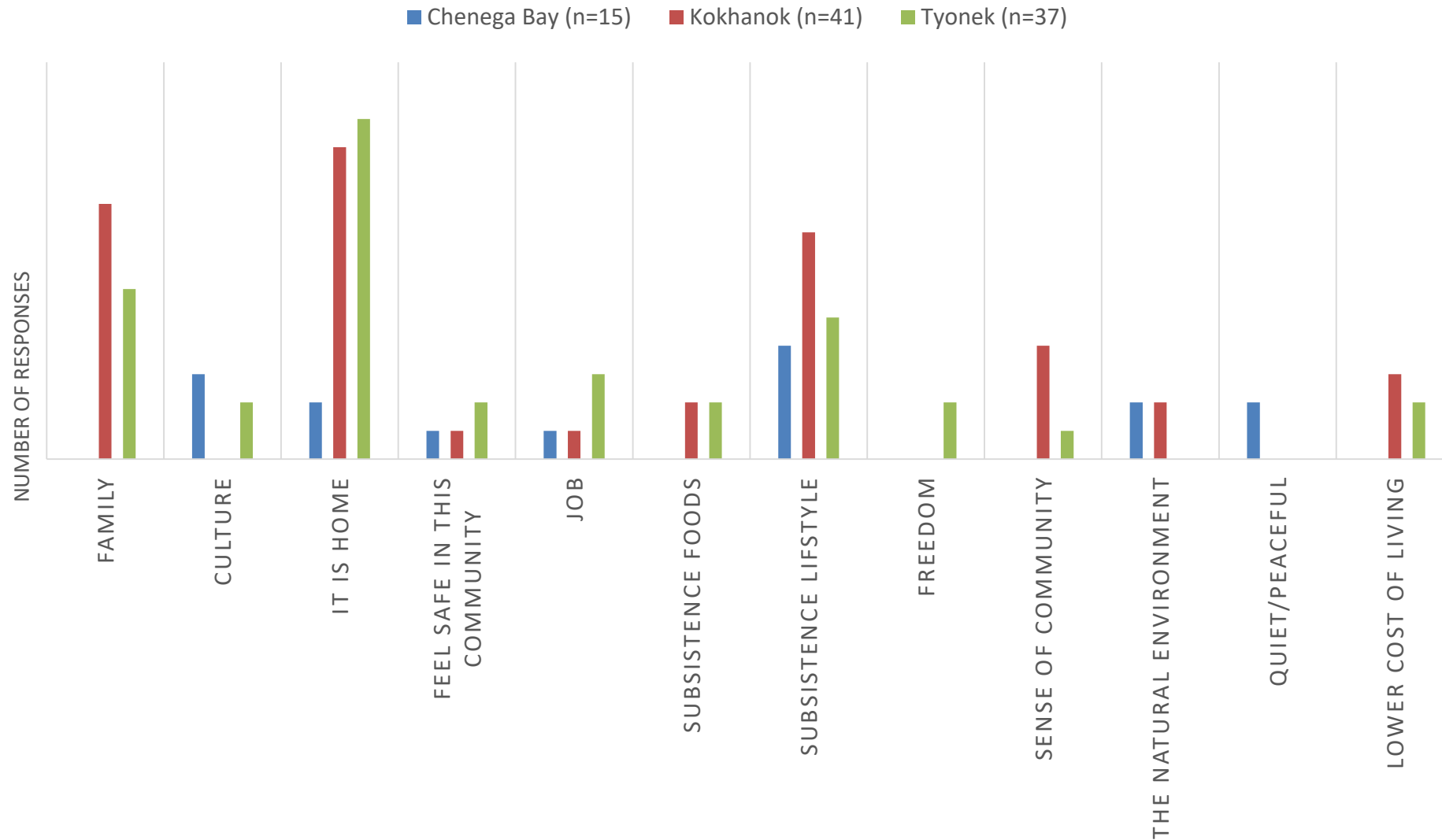




## PER CAPITA HARVEST OF WILD RESOURCES

Source: Adopted from Fall, James 2016. *Subsistence in Alaska: A Year 2014 Update*. Alaska Department of Fish and Game, Division of Subsistence.





## Primary reasons residents continue to reside in their community, Household survey 2012

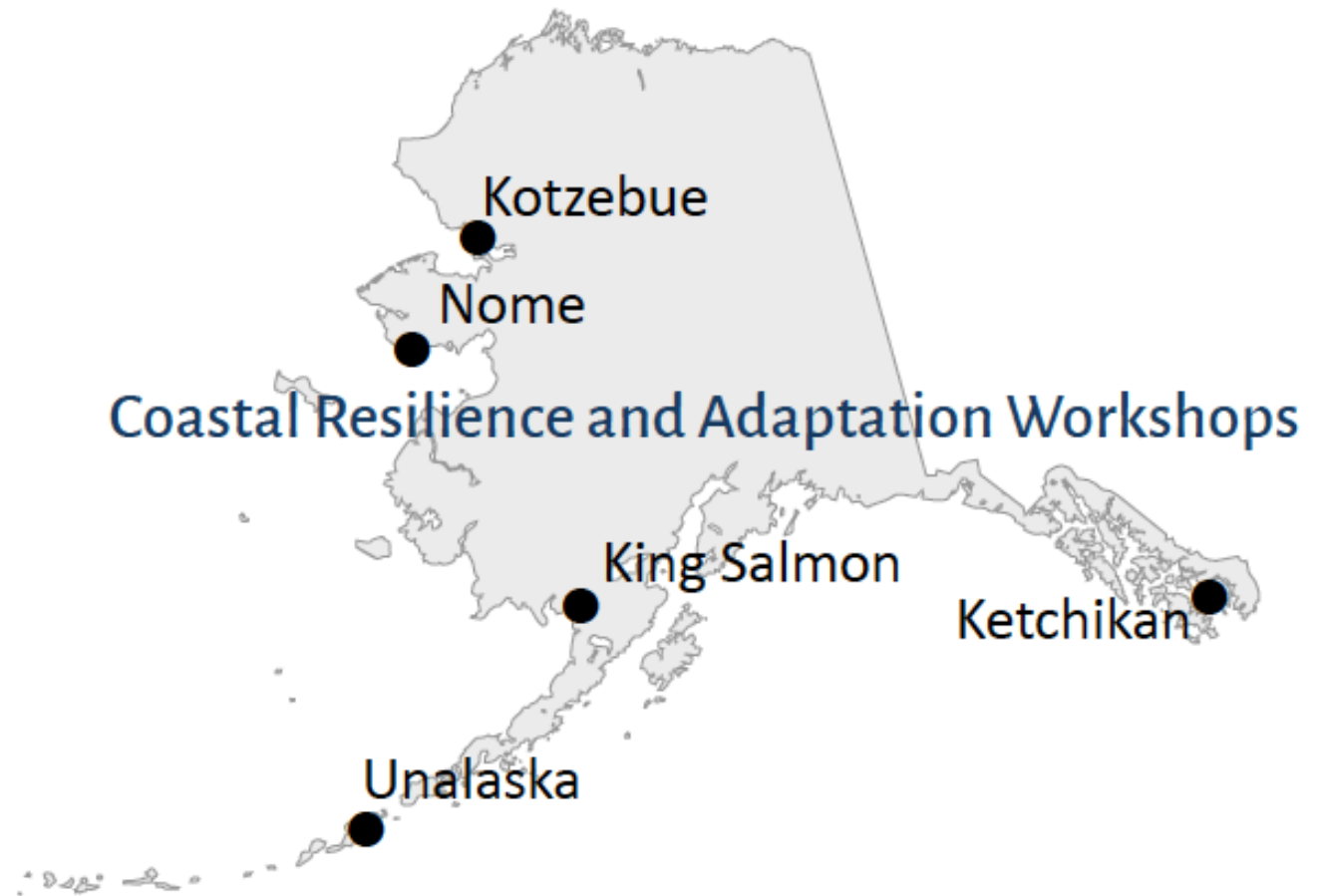
Source: 2014 Holen, Davin. *Fishing for community and culture: The value of fisheries in rural Alaska*. Polar Record. Cambridge University Press.

# Coastal Resilience Workshops 2015-2016

- Dialogue Between Agencies, Researchers, Tribes, and Nonprofits
- 300 participants from 52 Tribes and 16 State and Federal Agencies

Western Alaska Coordinated by:

- Alaska's Landscape Conservation Cooperatives
- Aleutian Pribilof Islands Association
- Alaska Sea Grant Marine Advisory Program



# Western Alaska Regional Issues

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Ocean Acidification

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Changes in Seasonality

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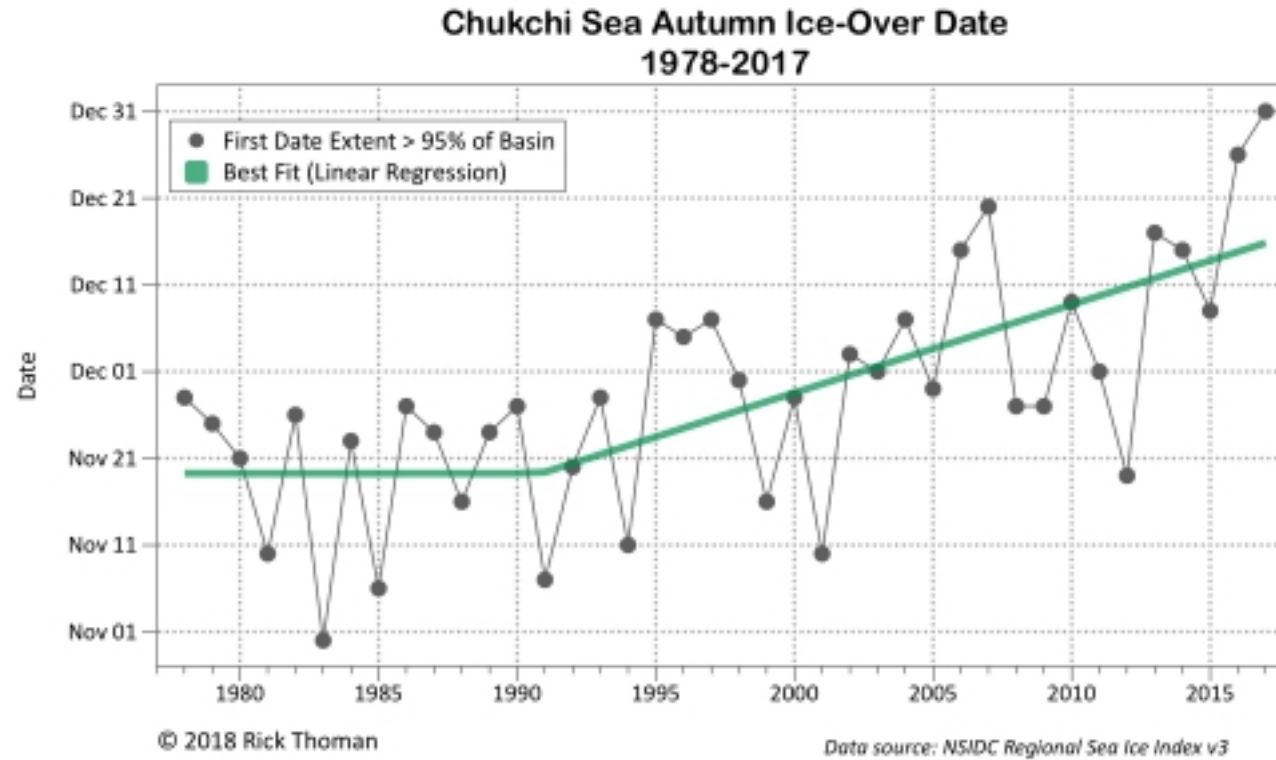
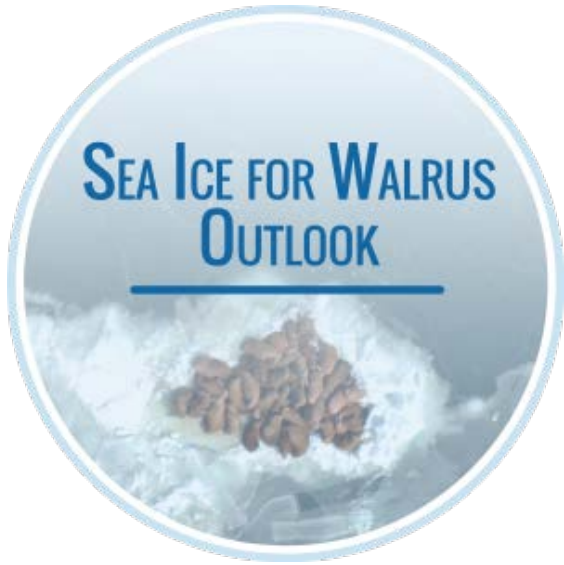
Changes in Hydrology

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Permafrost Thaw

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Reduction of Sea Ice



Nearshore lack of shorefast ice at Shishmaref during storm on February 22, 2018. Note ice blocks thrown onshore. (Source: Sharon Nayokpuk, as reported through the Local Environmental Observer Network, <http://leonetwork.org>)



<https://www.arcus.org/siwo>



# Sustaining Subsistence, Life & Culture as the Climate Changes

Climate change is here today and accelerating, transforming the land, waters, plants and animals of western arctic Alaska. Communities, tribal organizations, land managers, researchers and agencies will all need to work together to respond to these serious challenges, and where possible seize on new opportunities.

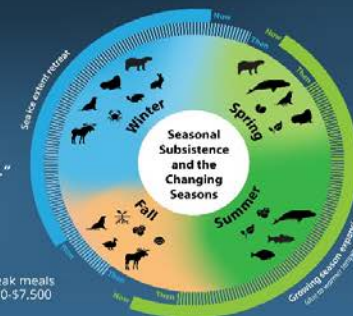
## More Than Just Food: Family, Fitness, Identity, Community, Memory, Spirit

Subsistence is the heart of life of western arctic Alaska. The image below, based on a UAF Native Knowledge Network graphic, gives a generalized picture of foods used through the seasons, and how these seasons are changing. "For us, it's like someone moved the calendar by a month and nobody told us. We wonder what it must be like for the animals, plants and fish."

### What's a Walrus Worth?



  
 About 560 pounds of useable, high quality meat = Provides equivalent of about 800 steak meals  
 Estimated replacement cost - \$6,000-\$7,500



## PROVIDING FOOD

- Grow food locally; re-establish tradition of household gardens; build greenhouses... "We're growing potatoes in Teluk!"
- Should we create seed banks, help establish naturally occurring berries, other foods in new locations?
- "Greenhouses and gardens may be one adaptation strategy but they don't work everywhere. The land is our garden. That is what is preferred."
- "Traditional foods are currently safe for just about everyone - but that may be changing."
- "Turkeys are more cold tolerant than chickens - but bears will eat 'em both!"
- New subsistence practices, equipment, and more flexible regulations
- "The last couple of winters in Bristol Bay we've had almost no snow - you can't use your snowmachine. And people have fallen through rivers and bays that don't freeze hard anymore."
- "With changes to subsistence resources, we need policies that adapt but regulations are very static and difficult to change."

## LIVING WITH RISING WATERS

- "Some of us are going to have to do things in new ways, make those calls ourselves, do things for ourselves"
- New, mobile infrastructure: new styles of building, weather appropriate buildings
- Well outfitted community buildings for short term emergencies
- Dispersed seasonal subsistence camps and shelters "we've been nomadic in the past"
- New energy sources, micro hydro

## WORKING TOGETHER TO TRACK CHANGE

- New, standardized protocols for local monitoring to better quantify change
- New regional partnerships to blend traditional knowledge and formal scientific research
- "Need to do a better job of bringing science back to communities, to let people know what is happening so we can see what to do to change ahead of time."
- "Need to improve salmon monitoring to understand changing run times."

## Response to Change:

"We have always been adaptive, resilient people" For thousands of years, Alaska's traditional cultures have shown remarkable resilience, applying a mix of ancient and new skills to adapt, survive and thrive. Sections with stars below highlight emerging strategies to sustain lives and cultures in the face of climate change.

This project was a collaborative effort of many partners, led by the Aleutian Pribilof Islands Association and three Landscape Conservation Cooperatives (Aleutian Bering Sea Islands, Western and Arctic), working with Agnew-Beck Inc. and the University of Washington Center for Environmental Visualization. Funding was provided by the Bureau of Indian Affairs and U.S. Fish and Wildlife Service. To get involved, and for citations and more information see [www.northernalaskastudies.org](http://www.northernalaskastudies.org)

adaptalaska.org

# Southeast Alaska Regional Issues

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Warming Air Temperatures

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Snowfall Variation

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Ocean Acidification

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Warming Ocean Temperatures

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Harmful Algae Blooms

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Changes in the Forest Environment





Raymond Paddock  
Environmental Program

# SOUTHEAST ALASKA CLIMATE ADAPTATION SUMMIT: SOUTHEAST ENVIRONMENTAL CONFERENCE



Chris Whitehead  
Sitka Tribe of Alaska

## Goals:

1. Review current status of 5 resources identified as culturally important. Also include human health.
2. Initiate monitoring and mitigation strategies.
3. Develop regional adaptation plan.

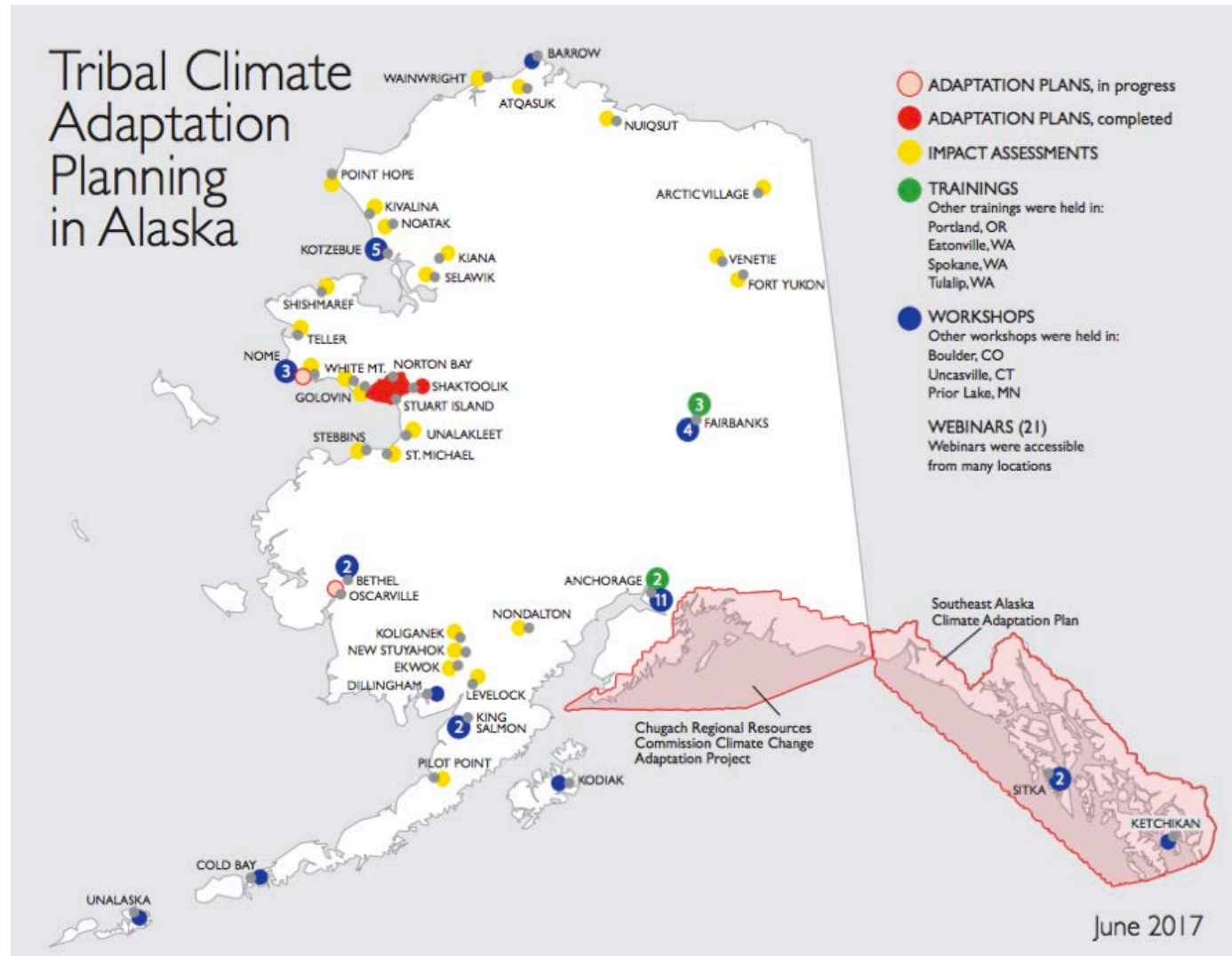
- Salmon
- Shellfish
- Berries
- Yellow cedar
- Cultural sites
- Human health

} Forest  
Environment

September 22-23, 2016 in Ketchikan, Cape Fox Lodge

50 Tribal members from Southeast Alaska

30 presenters and other participants from State and Federal Agencies, the University, and Non-profits



Source: *A Synthesis of Climate Adaptation Planning Needs in Alaska Native Communities*

Danielle Meeker, Scripps Institution of Oceanography (Currently Alaska Sea Grant Fellow, Lt. Governor Byron Mallott's Office)

Nathan Kettle, University of Alaska Fairbanks

# Collaborative Partnerships

- Salmon Life-cycle modeling in Southeast Alaska
- Harmful Algae Bloom Network
- Alaska Ocean Acidification Network

## UNDERSTANDING THE FUTURE OF SALMON IN SOUTHEAST ALASKA

### WITH COMMUNITY PARTICIPATION

#### WHAT'S THE PROBLEM?

- Warmer temperatures, more rain, and less snow in the future are expected to lead to warmer water, lower summer flows, and more severe winter floods.
- These changes have the potential to affect salmon at all freshwater stages – migrating and spawning adults, eggs, and juveniles.
- It's unclear how the combination of these effects will affect salmon populations in individual streams, and across the region as a whole.

#### WHAT'S THE PLAN?

- Use community-based stream temperature and flow data to assess salmon populations under future conditions.

#### HOW CAN YOU PARTICIPATE?

- Provide suggestions for streams and rivers to include in the study.
- Share previously collected data from your stream.
- Collect new data from your stream with project support (equipment, personnel to help with installation, and data management).
- Participate in a workshop to learn about project results, and how to assess salmon populations in your watershed.

#### WHAT ARE THE BENEFITS?

- Existing and/or new data collection in your streams can be supported by the project with equipment, training, and data management.
- Learn about projections for salmon productivity in your critical streams and rivers, and in the region as a whole.



(L-R) Derek Poinsette, Rebecca Bellmore, Johnnie Gamble, Daniel Klanoff. Photo by Jessica Forster.

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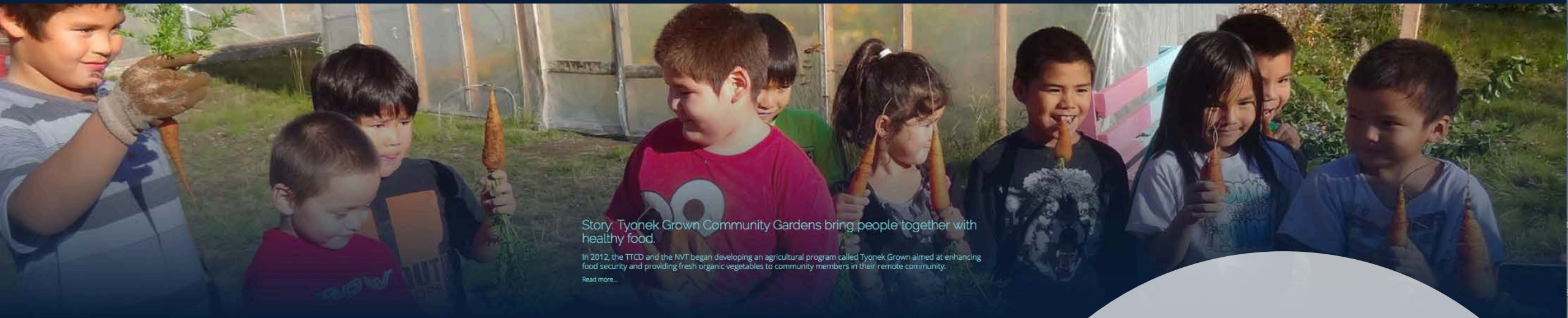
## How Can We Adapt?

Whether at the individual, local or regional level, we can all contribute to finding solutions to the environmental, social and political changes we now face. The more we work together, the greater our collective power to get out in front of those changes and create a better future. Find out more about how we can adapt.

[What's Changing?](#) / [How Can We Adapt?](#)

# RECOMMENDATIONS

- General fund for state agencies and university faculty to match federal funds.
- Research on impacts to subsistence economies by ADF&G and the university.
- Resources to provide community scale climate data and projections of change.
- More tools for resource managers to shift hunting and fishing seasons.
- Research on impacts of ocean acidification in the nearshore environment to important commercial and subsistence fishery stocks.
- Research in the marine environment to better understand stress on salmon stocks, especially Chinook.
- Promote innovative food production in rural Alaska such as aquaculture, community gardens and farms, and habitat improvement for wild resources.



Story: Tyonek Grown Community Gardens bring people together with healthy food.

In 2012, the TTCD and the NVT began developing an agricultural program called Tyonek Grown aimed at enhancing food security and providing fresh organic vegetables to community members in their remote community.

[Read more...](#)

## How Can We Adapt?

We all have the power to do something.

Whether at the individual, local or regional level, we can all contribute to finding solutions to the environmental, social and political changes we now face. The more we work together, the greater our collective power to get out in front of those changes and create a better future.

Over six months in 2016, almost 200 participants from 34 tribes, 14 state and federal agencies, and several research institutions shared their insights on the most urgent risks and vulnerabilities for coastal communities and resources. They also identified key opportunities for collaboration between communities and agencies. The majority of these participants worked for tribes, agencies or other local entities struggling with decisions relative to climate change and other environmental impacts. A common theme in all four workshops was the desire for local communities to have a leadership role in coastal resilience and adaptation efforts. Central to having that control was access to reliable scientific information, better access to resources for planning and mitigation as well as 'real-world' case studies of successful adaptation to Alaska's changing coasts.



Leadership & Communication



Natural Systems



Public Infrastructure



Health and Culture



Other Economic Activities



Mitigation and Emergency  
Preparedness

# Explore Adapt Alaska to Learn More

[dlholen@alaska.edu](mailto:dlholen@alaska.edu)

[adaptalaska.org](http://adaptalaska.org)

*Thank you to Lisa Delaney and  
Representative Andy Josephson  
for the invitation.*