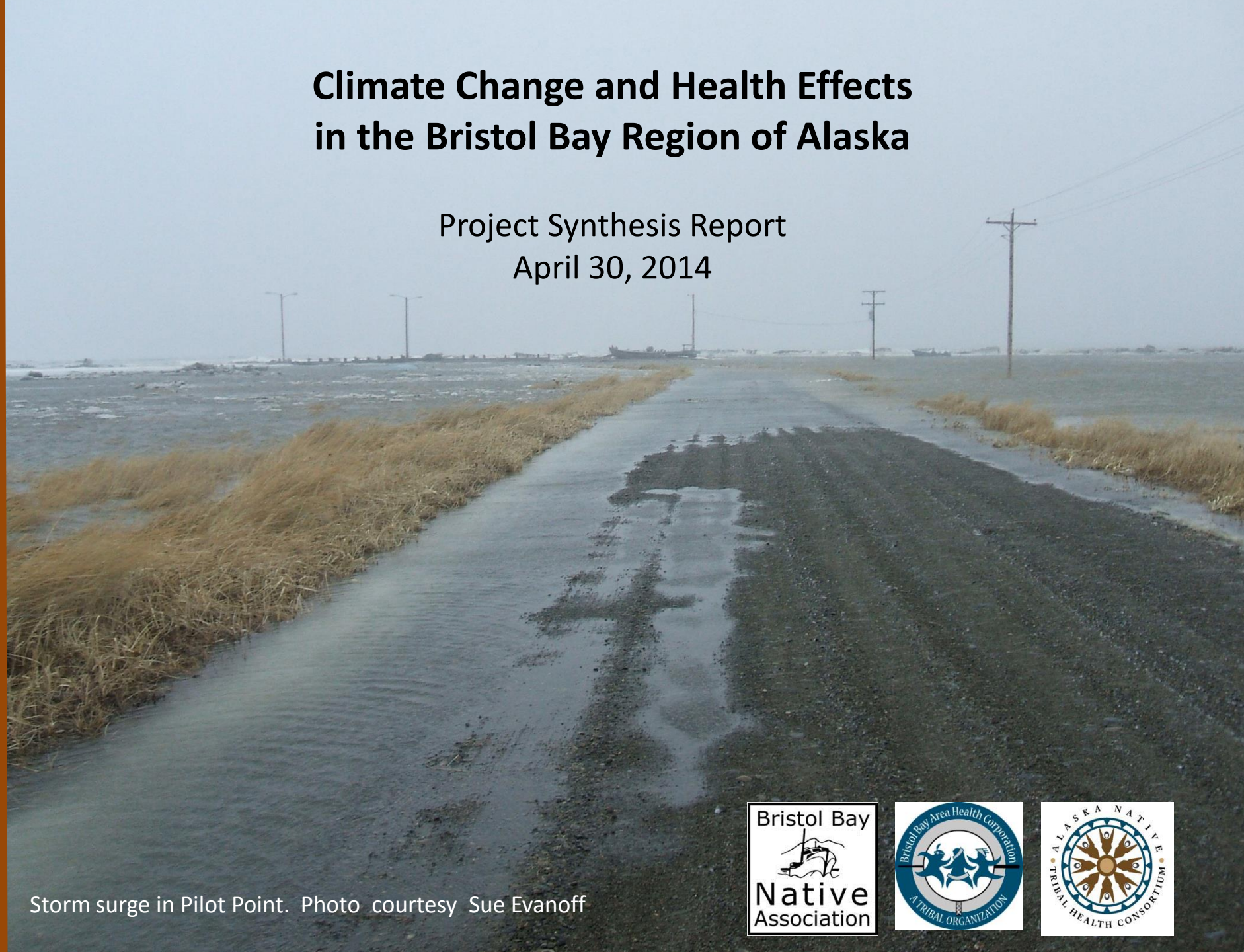
Climate Change and Health Effects in the Bristol Bay Region of Alaska

Project Synthesis Report
April 30, 2014



Storm surge in Pilot Point. Photo courtesy Sue Evanoff

Bristol Bay Native Association

Bristol Bay Area Health Corporation
A TRIBAL ORGANIZATION

ALASKA NATIVE TRIBAL HEALTH CONSORTIUM

Primary funding provided by:
The Western Alaska Landscape Conservation Cooperative

With supplement funding by the U.S. Environmental Protection Agency and our tribal partner throughout the region.

Thank you for your support !

Mount Chiginagak Volcano, from Pilot Point. Photo courtesy of Sue Evanoff

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Nikki Shanigan – Pilot Point Tribal Council
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John Warren PE – Alaska Native Tribal Health Consortium
Jennifer Williamson - Alaska Native Tribal Health Consortium
Richard Drake – Rich Designs

Lake Clark near Port Alsworth. Photo Mike Brubaker

In 2012 the Bristol Bay Native Association (BBNA) in partnership with Bristol Bay Area Health Corporation (BBAHC) and the Alaska Native Tribal Health Consortium (ANTHC) began evaluating the connecting between climate change impacts and health. The purpose, to encourage wellness and to adapt to changes in the Bristol Bay region.

Summer in Nondalton. Photo Mike Brubaker

Nondalton fish camp. Photo Mike Brubaker

People in Bristol Bay live off the land and sustaining healthy natural resources is import for the culture, subsistence and for people's livelihood.

Warren Mokelke shows a nice catch of reds and king salmon, summer 2007. Photo courtesy Sue Evanoff

The Bristol Bay region includes 28 communities. The largest community and the transportation and government hub for the region is Dillingham, population approximately 2400, located 329 air miles from Anchorage.

Three focus communities were selected for this project with the purpose of describing local and regional climate change impacts. These include Nondalton a lake community, Levelock, a river community, and Pilot Point located on the coast of Bristol Bay.

In this project, climate change impacts was assessed through the lens of public health with an eye to potential effects on disease, injury, food and water security, and mental health. Climate sensitive health effects, some positive some negative, were identified from each category.

Acute or Chronic Illness

Food Security

Mental Health

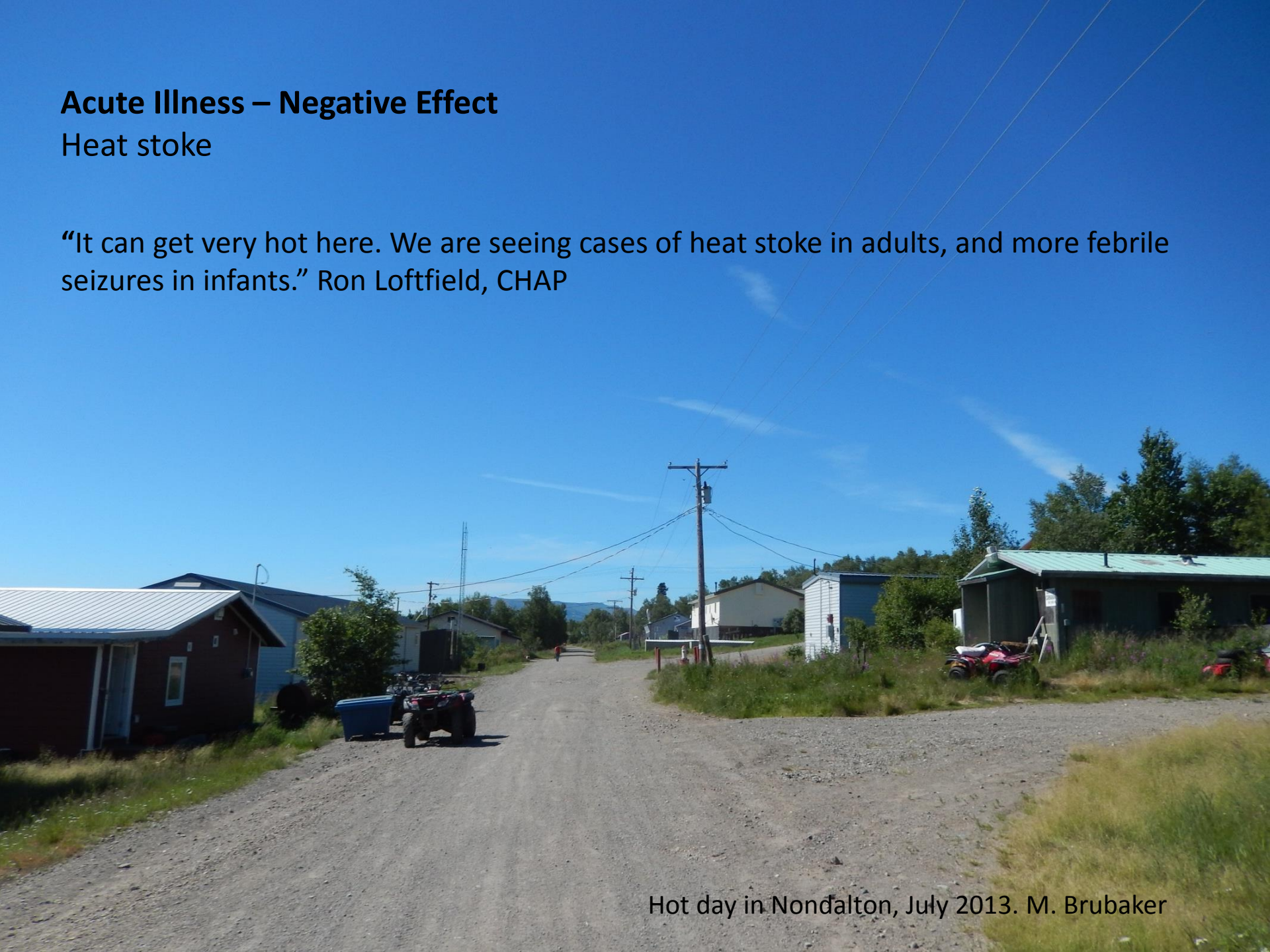
Injury

Water Security

Acute Illness – Negative Effect

Heat stoke

“It can get very hot here. We are seeing cases of heat stoke in adults, and more febrile seizures in infants.” Ron Loftfield, CHAP



Hot day in Nondalton, July 2013. M. Brubaker

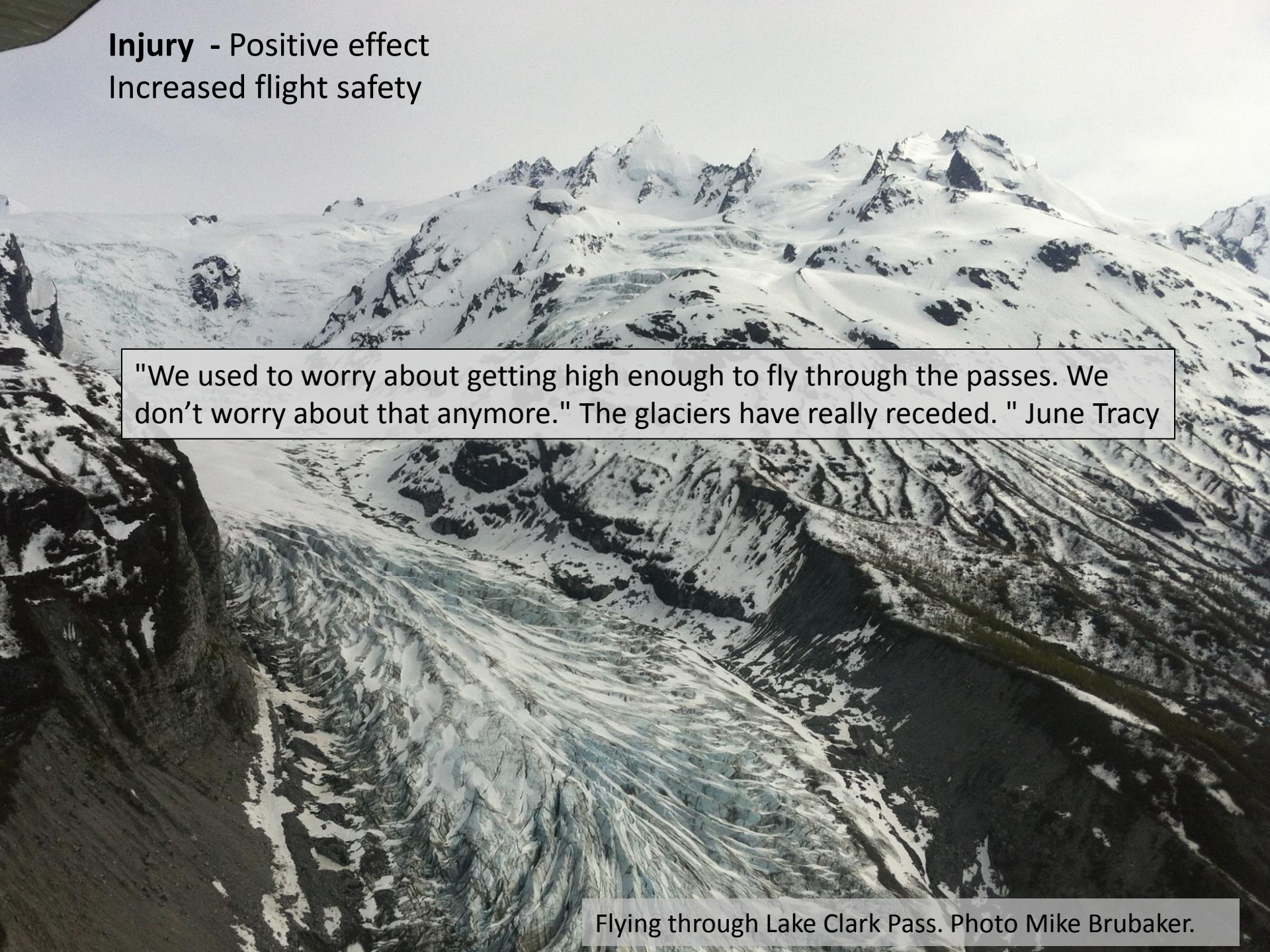
Injury - Negative effect

Increased Insect Stings

A 2008 Alaska Epidemiology Bulletin reported that the number of people showing up in Alaska health clinics for care from insect stings was increasing. The increase in Southwest Alaska was as 114%. A paper published in the journal Allergy and Asthma Proceedings suggested that the increase was climate related, due to an increase in wasp survival due to a warmer winter, of increased snow cover (Demain J, 2009).

Google screen shots

Injury - Positive effect
Increased flight safety



"We used to worry about getting high enough to fly through the passes. We don’t worry about that anymore." The glaciers have really receded. " June Tracy

Flying through Lake Clark Pass. Photo Mike Brubaker.

Mental Health - Negative effect

"Last winter was bad for mental health. The weather was so bad it was very hard to get out of the house." Nikki Shannigan

A home on Pilot Point bluff. Photo Mike Brubaker


Mental Health - Positive effect
Fun healthy outdoor activities

Food Security – Negative effect

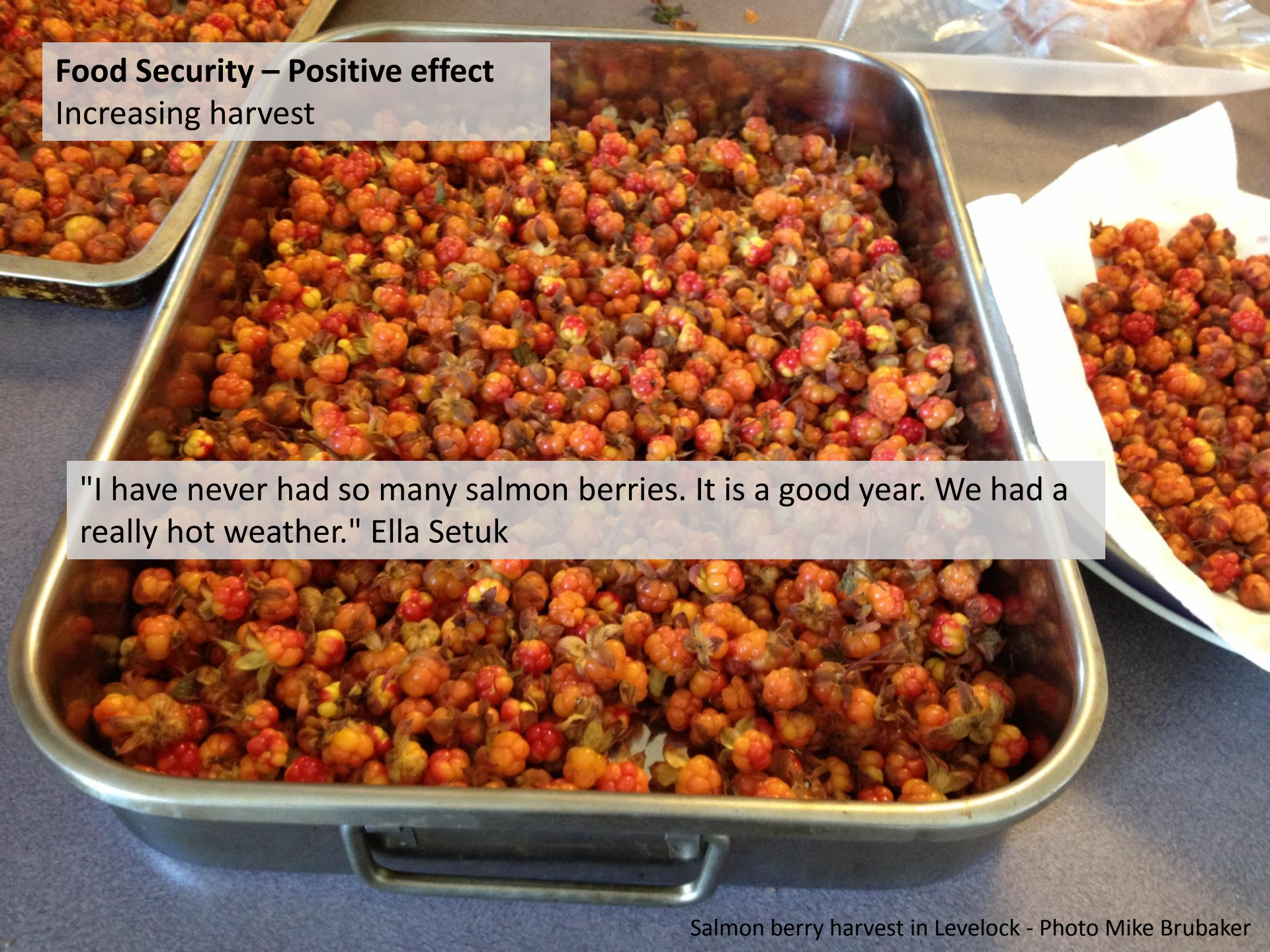
Declining harvest

"We have not been able to successfully harvest caribou from the Mulchatna herd in six years." Ronald Loftfield

Photo courtesy of ADF&G

Food Security – Positive effect
Increasing harvest

"I have never had so many salmon berries. It is a good year. We had a really hot weather." Ella Setuk



Salmon berry harvest in Levelock - Photo Mike Brubaker

Water Security – Negative effect

Water source vulnerability (flooding)

The community well head in Nondalton. Photo: Mike Brubaker

The project idea came out of a regional tribal climate change conference hosted by BBNA and held in Dillingham in May 2011.

A project team was developed with tribal organization representatives.

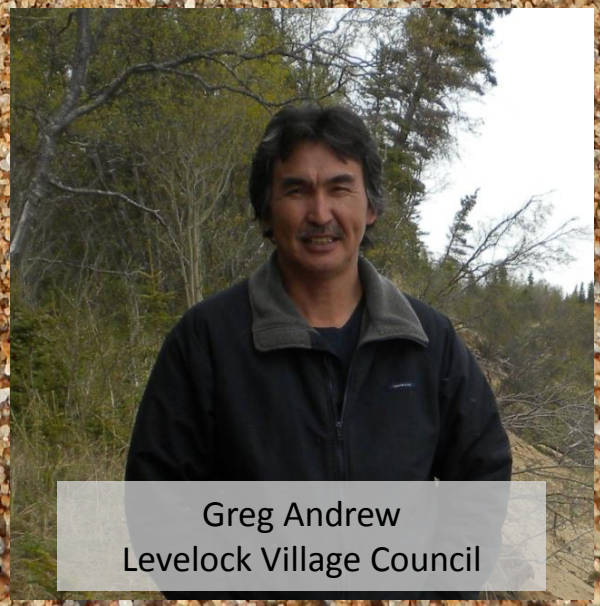

Sue Flensburg, BBNA


Mike Brubaker - ANTHC


Nikki Shannigan
Pilot Point Tribal Council


Jennifer Skarada - BBAHC

Charlotte Balluta
Nondalton Traditional Council


Greg Andrew
Levelock Village Council

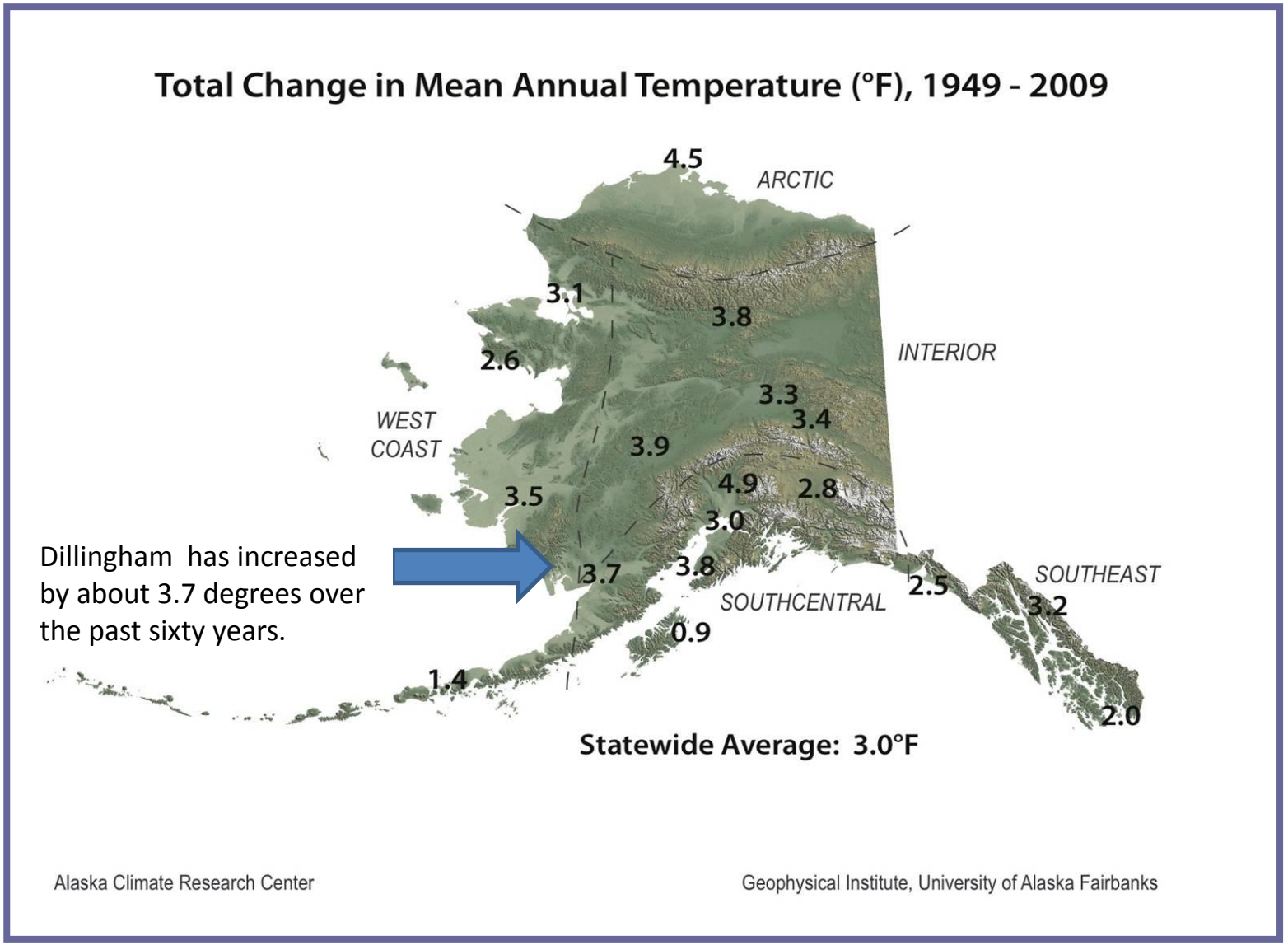
And three key questions were identified:

1. What are the impacts of climate change?

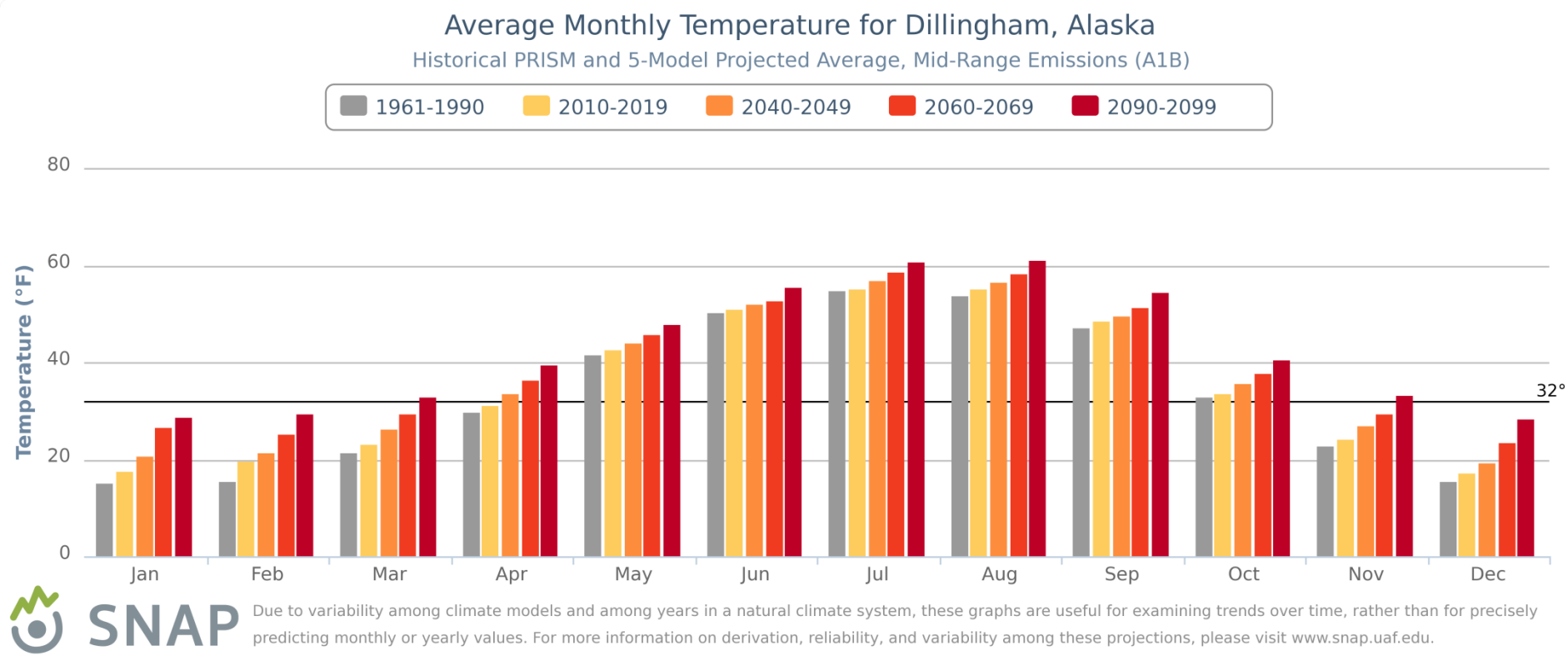
2. How do they effect community health?

3. How can communities adapt in ways that encourage wellness?

Background on Climate Change –National Weather Service temperature data indicates that Dillingham has been warming rapidly.



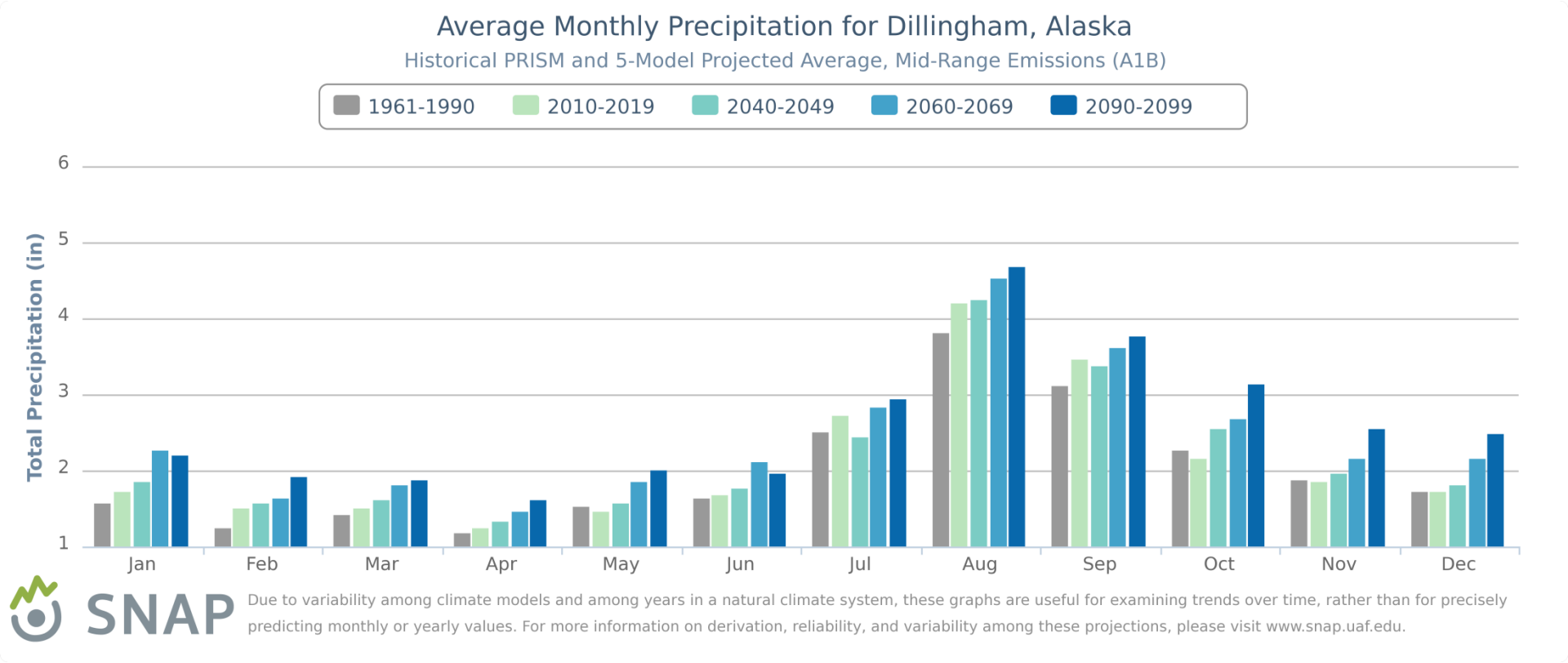
The region is becoming warmer.



Comparing these two periods, 1961 – 1990 (grey) , and 2010 – 2012 (yellow), the temperature in Dillingham has increased in every month.

Nondalton, July 2013. M. Brubaker

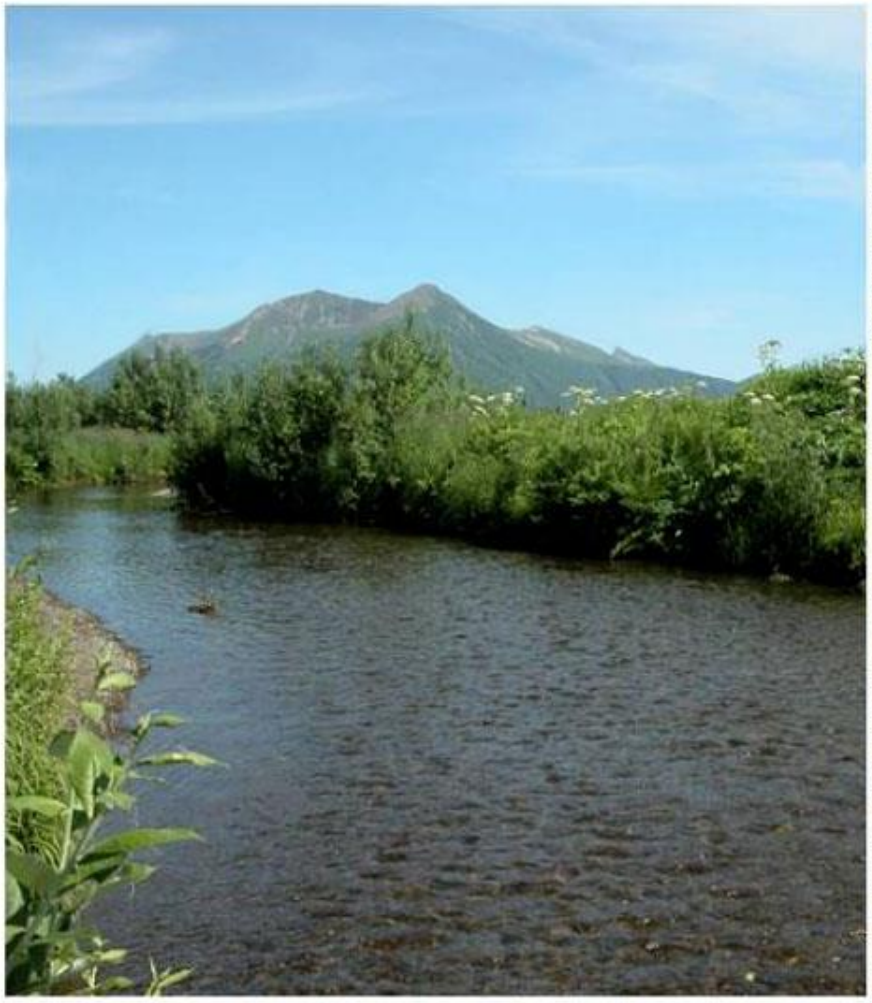
The region is becoming wetter.



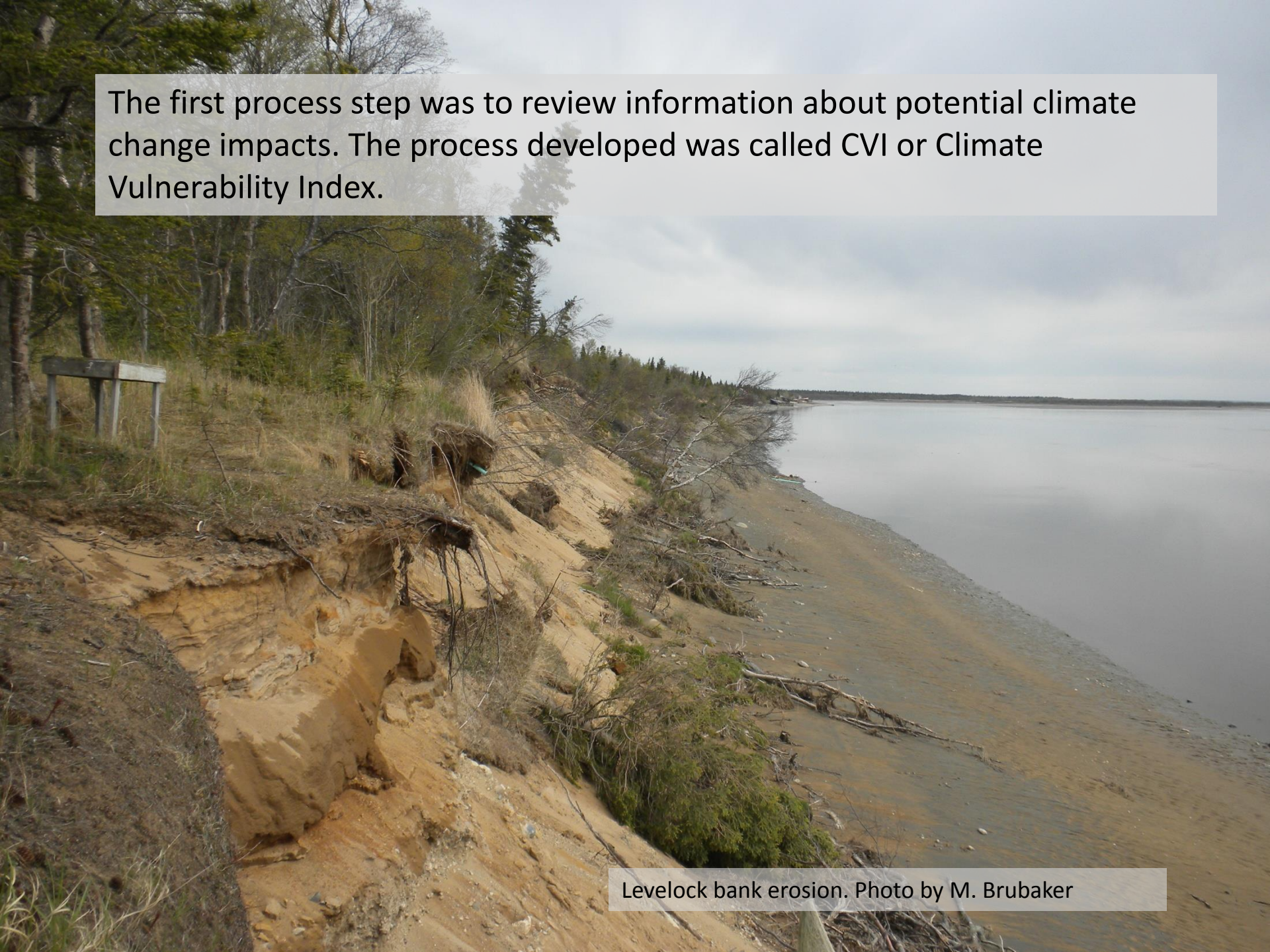
Comparing these two periods, 1961 – 1990 (grey), and 2010 – 2012 (green), precipitation has increased in eight months, decreased in three and remained relatively stable in only one - December. The type of precipitation is also changing, with increases in winter rain events and generally a shorter snow season.

"We used to have a lot of snow machines in Pilot Point. Now I don’t think there is a single snow machine in town." Nikki Shanigan

Photo courtesy of Native Village of Pilot Point



"In low snow years, there is not enough spring flood to bring the salmon carcasses back into the system." Dan Kingsley Pick Creek Alaska, Photo by Gordon Holtgrieve



The first process step was to review information about potential climate change impacts. The process developed was called CVI or Climate Vulnerability Index.

Levelock bank erosion. Photo by M. Brubaker

In the CVI - A review of available data was performed and communities were scored based on existing data about economic health, water and sanitation system vulnerability, flood history, and erosion conditions.

BRISTOL BAY REGION CLIMATE CHANGE VULNERABILITY INDEX (CVI)
Alaska Native Tribal Health Consortium, Center for Climate and Health, December, 2011

BACKGROUND DATA						VULNERABILITY SCORING DATA							
		CONTACT	POP	BIOME	WATERSHED	FOOD	WATER	ECONOMIC	WATER	FLOOD	EROSION		
	Community		DCCED	Lake/Coast/ River	Major Rivers Lakes, Bays	Harvest Survey	Source R / L / GW	Distressed + 1	Imperiled +1	Historical +1	Baseline +1 to +3	Total	Ranking 1-5
	Reference	S. Flensburg		S. Flensburg	S. Flensburg	ADF&G	B. Reed	Denali C.	ADEC/BBAHC	T. Boothby	C. Borash		
1	*Aleknagik*	Dan Chythlook Tina Tinker	219	L	Aleknagik Lake at head of Wood River	84	GW	0	0	0	2	2	3
2	*Chignik Bay**	Jeanette Carlson	91	C	South Shore of Alaska Peninsula	84,89,91,03	L	0	0	1	1	2	3
3	***Chignik Lagoon****	Carol Grunert Angela Gregorio	78	C	South Shore of Alaska Peninsula	84,89,03	GW	0	1	1	2	4	1
4	Chignik Lake*	Della Takak Inez O'Domin	73	C	South Shore of Alaska Peninsula	84,89,91,03	GW	1	0	1	1	3	2
5	**Clarks Point**	Susie Wassillie	62	C	Nushagak Bay	84	GW	1	0	-	3	4	1
6	**Dillingham***	Billy Maines	2329	C	Nushagak Bay	84	GW	0	0	1	3	4	1
7	*Egegik**	Jessica Chernikoff	109	R	Egegik River	84	GW	0	0	0	2	2	3
8	Ekuk	Jennifer Robinette		C	Nushagak Bay	-	GW	0	0	1	1	2	3
9	Ekwok	Lorraine King	115	R	Nushagak River	87	GW	1	0	0	1	2	3
10	Goodnews Bay	Alice Julius	246	R	Goodnews River	_	GW	1	0	1	0	2	3
11	*Igiugig**	Christina Salmon Sheryl Wassillie	50	R	Kvichak River	83,92,05	GW	0	0	0	2	2	3
12	*Iliamna**	Sue Andrew	109	L	Iliamna Lake	83,91,04	GW	0	0	0	2	2	3
13	*Ivanof Bay**	George Anderson Nicole Cabrera	7	C	Kupreanof Peninsula	84,89	R (creek)	0	0	0	1	1	3
14	King Salmon**	Ralph Angasan, Jr.	374	R	Naknek River	83,07	GW	0	0	0	0	0	5
15	*Kokhanok**	Roy Andrew	170	L	Iliamna Lake	83,92,05	L	1	0	1	1	3	2

Climate Vulnerability Index (CVI) Here are the scoring outcomes by level of vulnerability, 1 highest to 5 lowest.

Community	Priority Level 1 Highest	Priority Level 2	Priority Level 3	Priority Level 4	Priority Level 5 Lowest
Aleknagik			x		
Chignik Bay			x		
Chignik Lagoon	x				
Chignik Lake		x			
Clarks Point	x				
Dillingham	x				
Egigik			x		
Ekuk			x		
Ekwok			x		
Goodnews Bay			x		

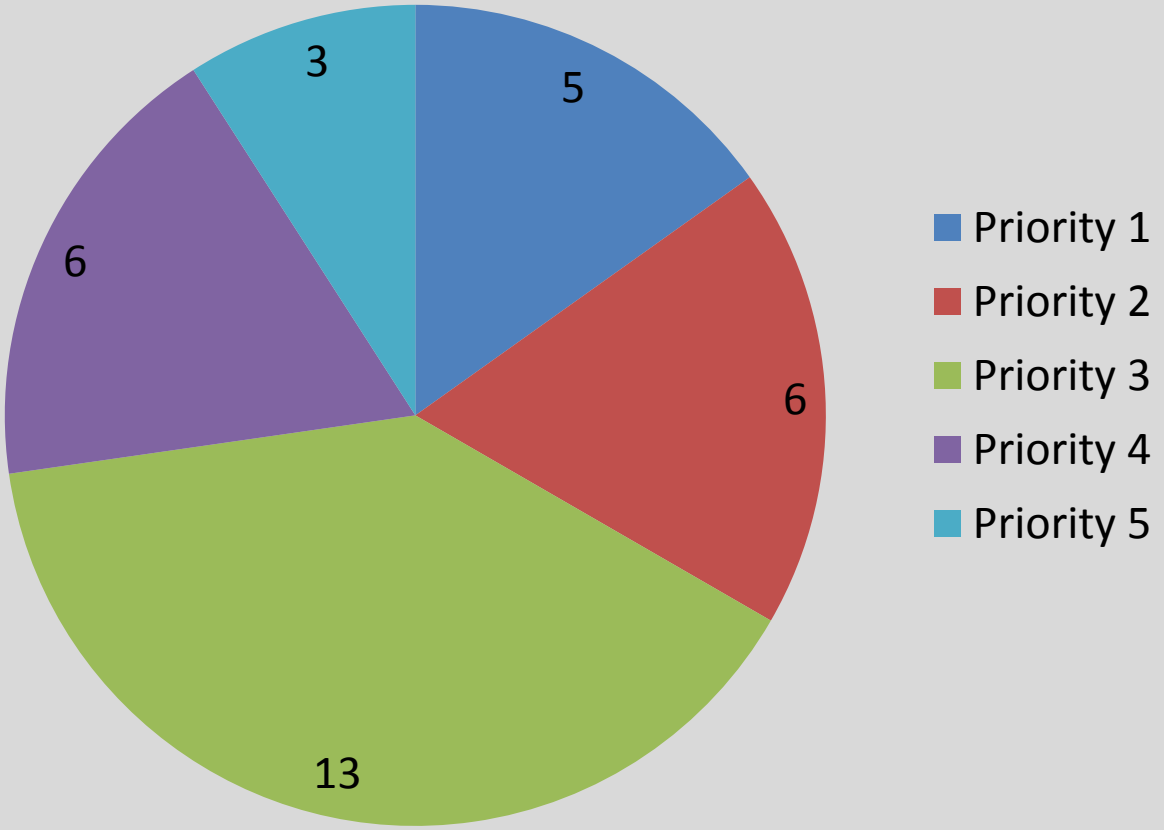
Community vulnerability scores continued:

Community	Priority Level 1 Highest	Priority Level 2	Priority Level 3	Priority Level 4	Priority Level 5 Lowest
Igiugig			x		
Illiamna			x		
Ivanof Bay			x		
King Salmon					x
Kokhanok		x			
Koliganek					x
Levelock		x			
Manokotak				x	
Naknek			x		
New Stuyahok				x	

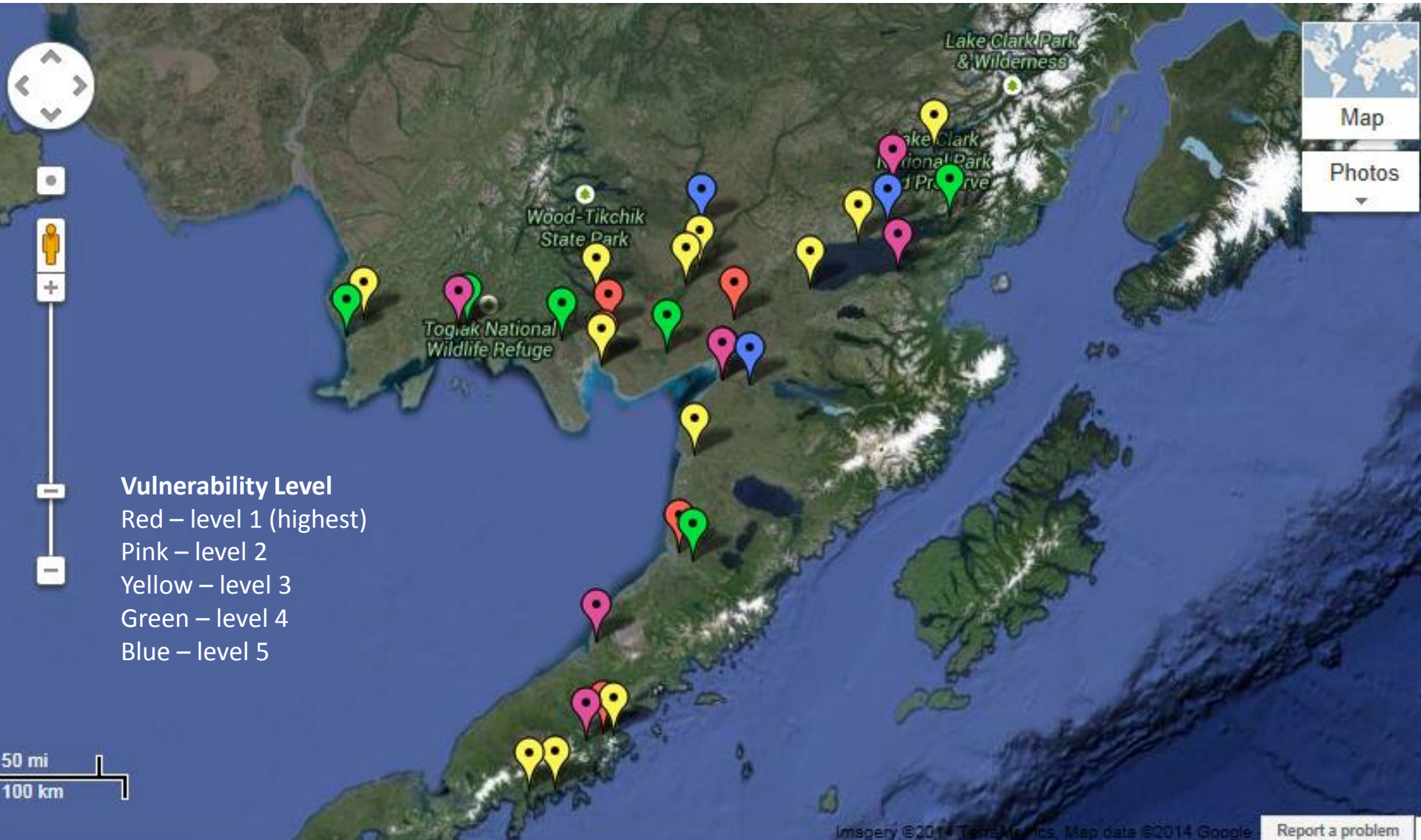
Community vulnerability scores continued:

Community	Priority Level 1 Highest	Priority Level 2	Priority Level 3	Priority Level 4	Priority Level 5 Lowest
Newhalen					x
Nondalton		x			
Pedro Bay				x	
Perryville			x		
Pilot Point	x				
Platinum				x	
Portage Creek				x	
Port Alsworth			x		
Port Heiden		x			
South Naknek			x		
Togiak		x			
Twin Hills				x	
Ugasik				x	

Distribution of Community Vulnerability Levels



Climate Vulnerability Index (CVI) – The following map is based on economic, water and sanitation, flood, and erosion data available from state and federal surveys. The CVI is limited to available information for the region and does not consider other climate change driven mechanisms such as sea level rise, wildfire or drought. Communities vulnerability levels were distributed throughout the region.



In addition to the CVI, a survey was distributed to environmental staff at tribal governments. The purpose was to help inform the project team on local perception about environmental change, and to identify climate change related concerns Completed surveys were received from twenty-two responses from fifteen communities were received.

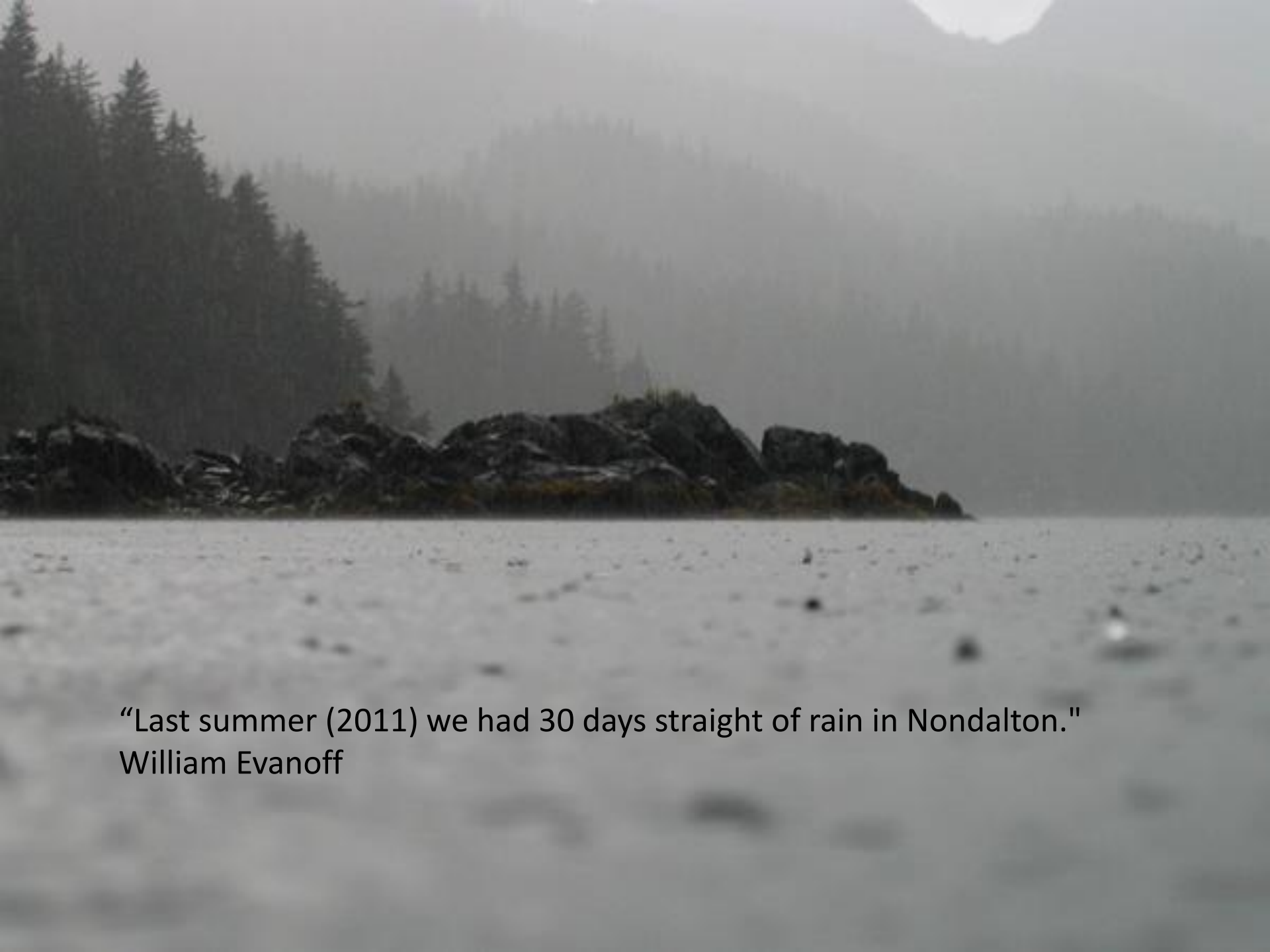
See Survey Form here.
See Survey Results here.

Climate Change In My Community (Bristol Bay)

50%

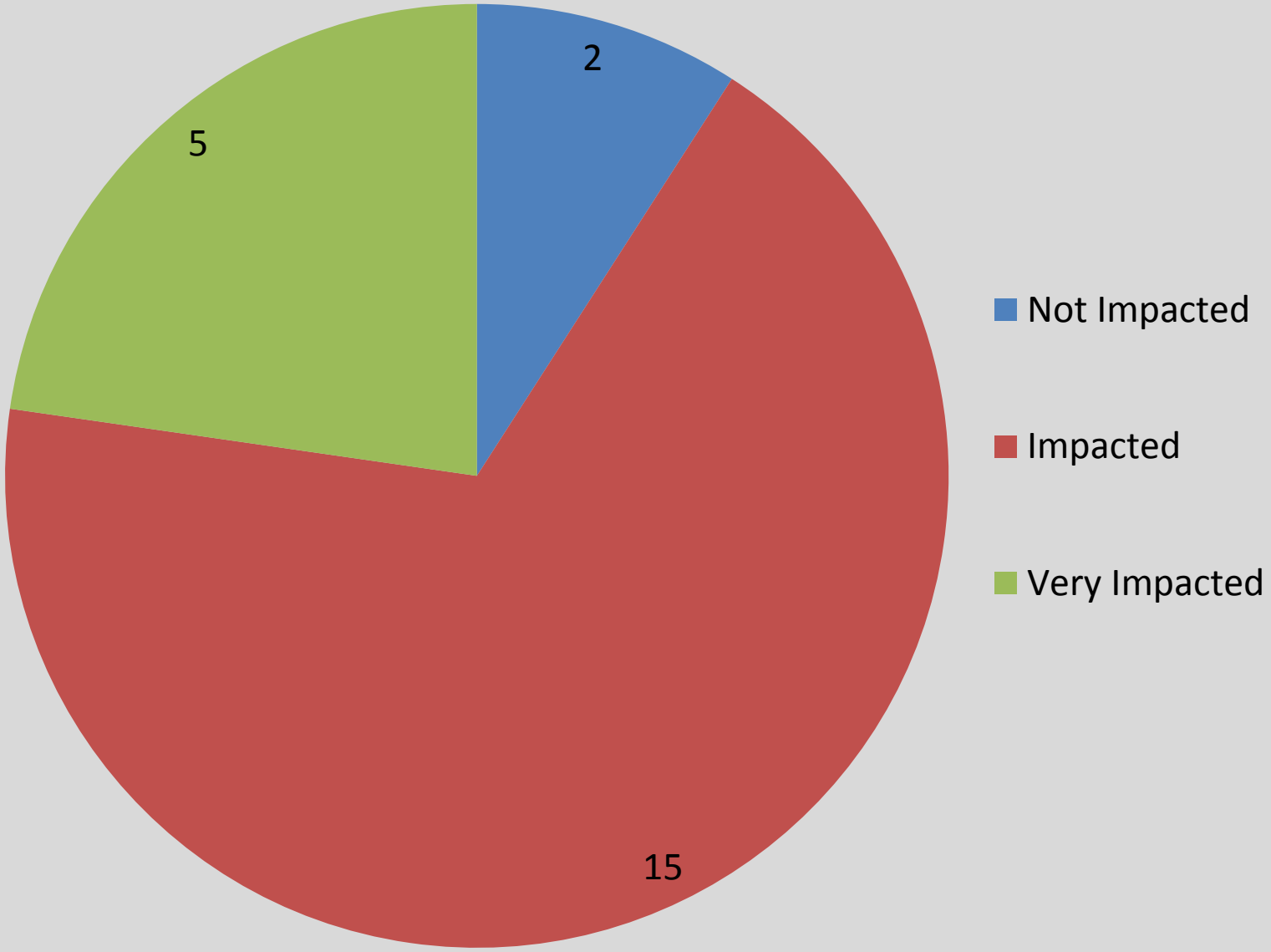
This survey is part of a climate change health impact assessment by ANTHC, BBNA and BBAHC. It is funded by a USF&W Landscape Conservation Cooperative grant. We hope to learn more about any climate change impacts you are experiencing in your community. With your help we can take an important step forward in addressing problems and realizing benefits from climate change. The survey will probably take you about 20 minutes and we are accepting surveys through February 20, 2012. Please note you will need to answer all "mandatory" questions, for the survey to properly close. We will compile the results and share them with you. Call Mike Brubaker at 729-2464 or Sue Flensburg at 842-6241 if you have any questions.

Submit



“Last summer (2011) we had 30 days straight of rain in Nondalton."
William Evanoff

How impacted is your community by climate change?



Are there good affects of climate change in your community?

Responses: community health conditions that are “Very Affected” by climate change.

Town	Water	Air	Housing	Food	Injuries	Travel
Aleknagik	x	x		x	x	x
Chignik Bay		x				x
Clarks Point						
Dillingham						
Egegik				x		
Ekuk						
Kokhanok	x	x		x	x	
Koliganek						
Levelock						
Manokotak	x			x		
Naknek						
Perryville						
Port Heiden						
Togiak		x		x		x
Twin Hills	x			x		
Ugashik						

On-Site Assessments: Based on vulnerability levels and the interest expressed by councils, the three communities were invited to participate with the on-site assessments

Sue Evanoff, Sophie Abyo and Nikki Shanigan from Pilot Point use field guides to identify new bird species during a on-site assessment.

Community On-site Assessment Components:

- Tribal council staff meeting and training (LEO, Community Camera Project)
- Public scoping meeting
- Community gathering event
- Community inspection – vulnerable sites and impacted areas
- Key contact interviews – environment / emergency managers, health aides
  Time lapse camera installation.
- In-kind contributions – meeting space, office space, vehicles, staff time etc.

Outputs

- Training of tribal staff
- Power point presentation
- Meeting minutes
- Photographs
- Time lapse video

On-Site Assessments begins with a meeting of the project team at the tribal office. Here Sue Flensburg, Charlotte Balutta and Jennifer Skarada plan the day.

Photo by Mike Brubaker

There were also interviews and community meetings, such as here in Nondalton, at fish camp.

Photo by Sue Flensburg

Time lapse cameras were installed in each community. The site was selected by the tribal environmental staff. The cameras take one image each day and record environmental conditions and change such as erosion, and seasonal indicators such as break-up. Here a Ron Loftfield and Mike Brubaker install a camera in Nondalton.

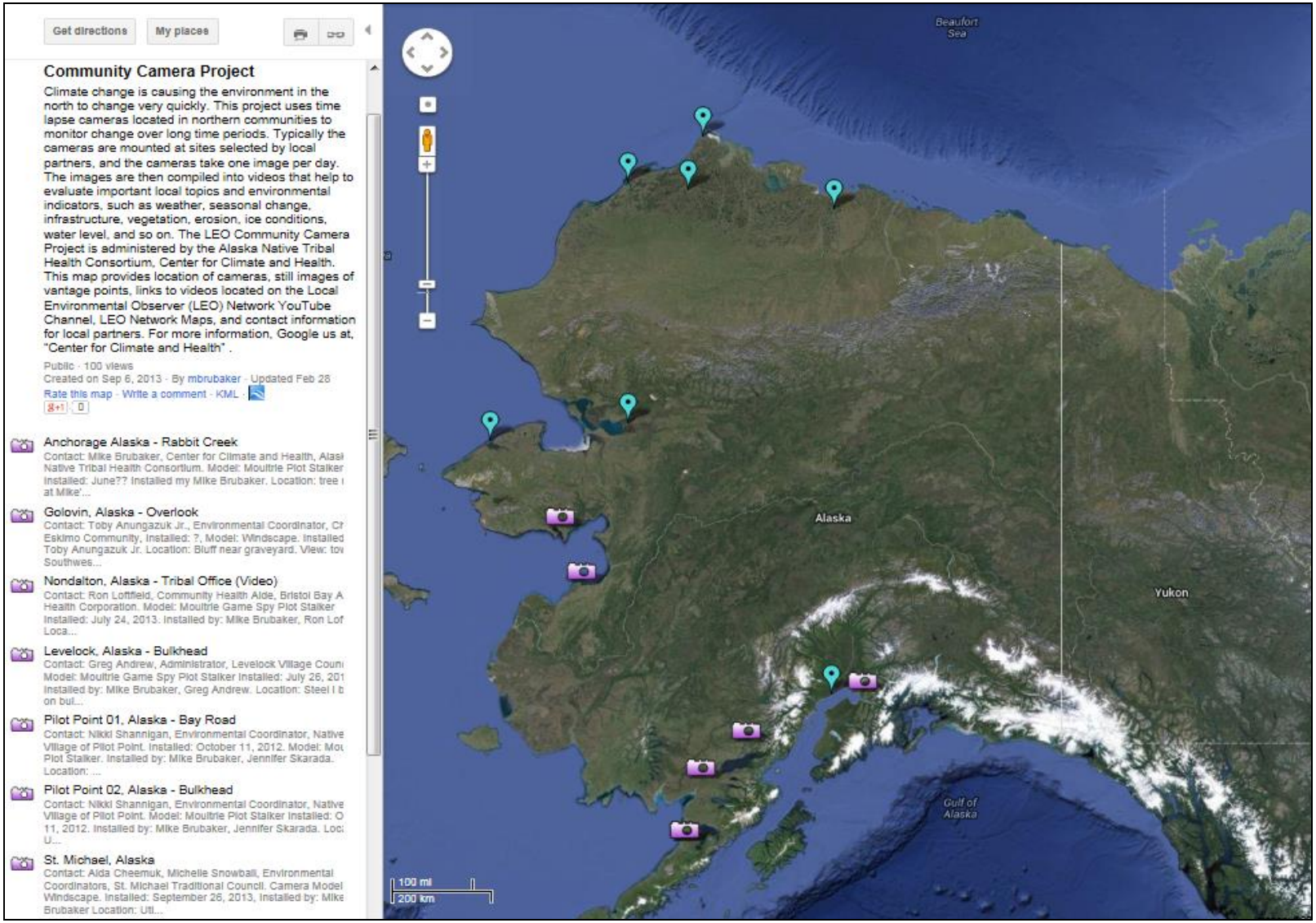
Photo by S. Flensburg

Here with Greg Andrews in Levelock,

Photo by M. Brubaker

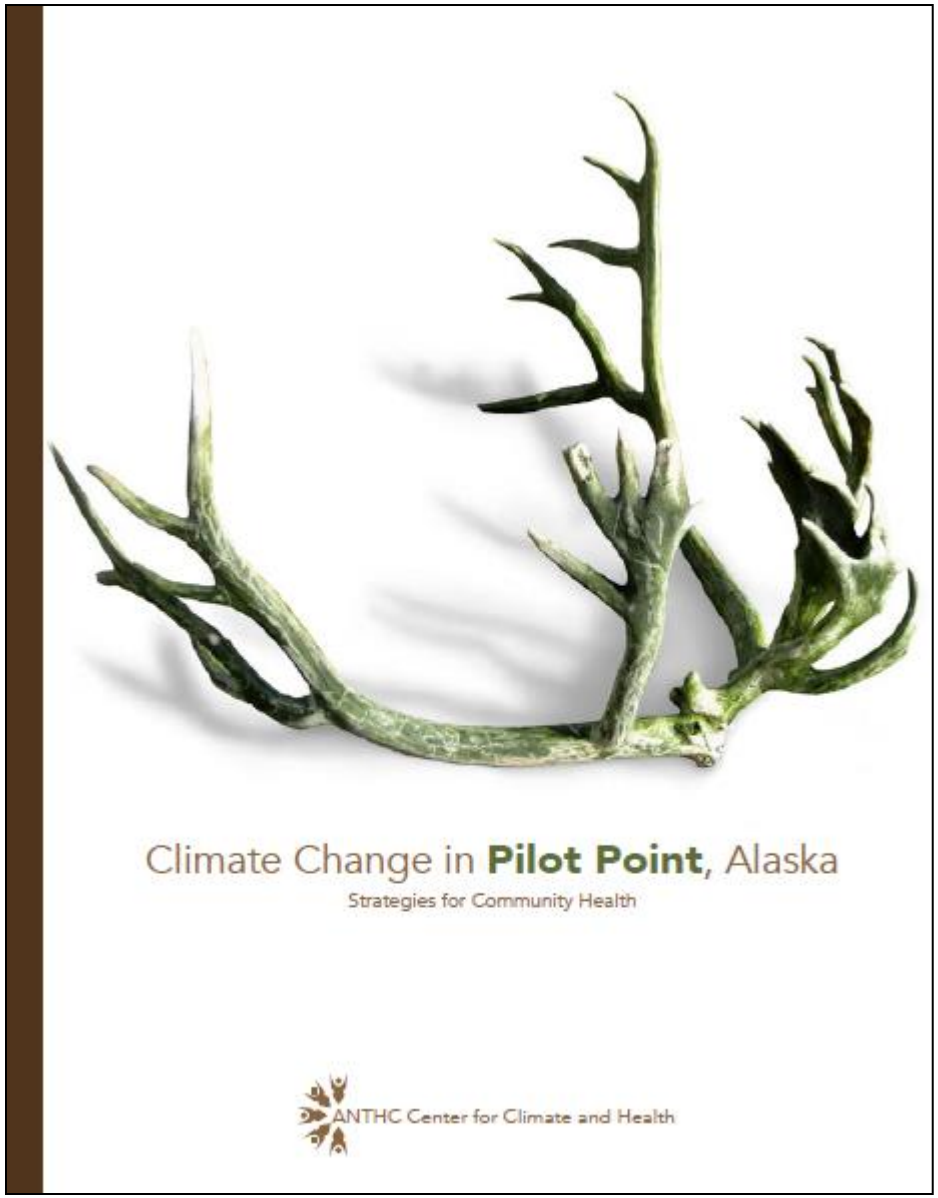

The camera is monitoring this view of river change along the Kvichak river.
Photo by M. Brubaker

Training, installation of time lapse cameras and enrollment in the LEO Community Camera Project were outcomes of this project. Here all of the time lapse camera information and clips are archived on a public Google Map. See Nondalton's first time lapse video here.



Pilot Point – A coastal community

Photo by Mike. Brubaker



Key Topics – Pilot Point

- Food harvest – caribou (-)
- Storm surge and flooding
- Erosion
- Winter warming
- Sea change
- Vegetation expansion
- Aggressive wildlife – bears, wolves

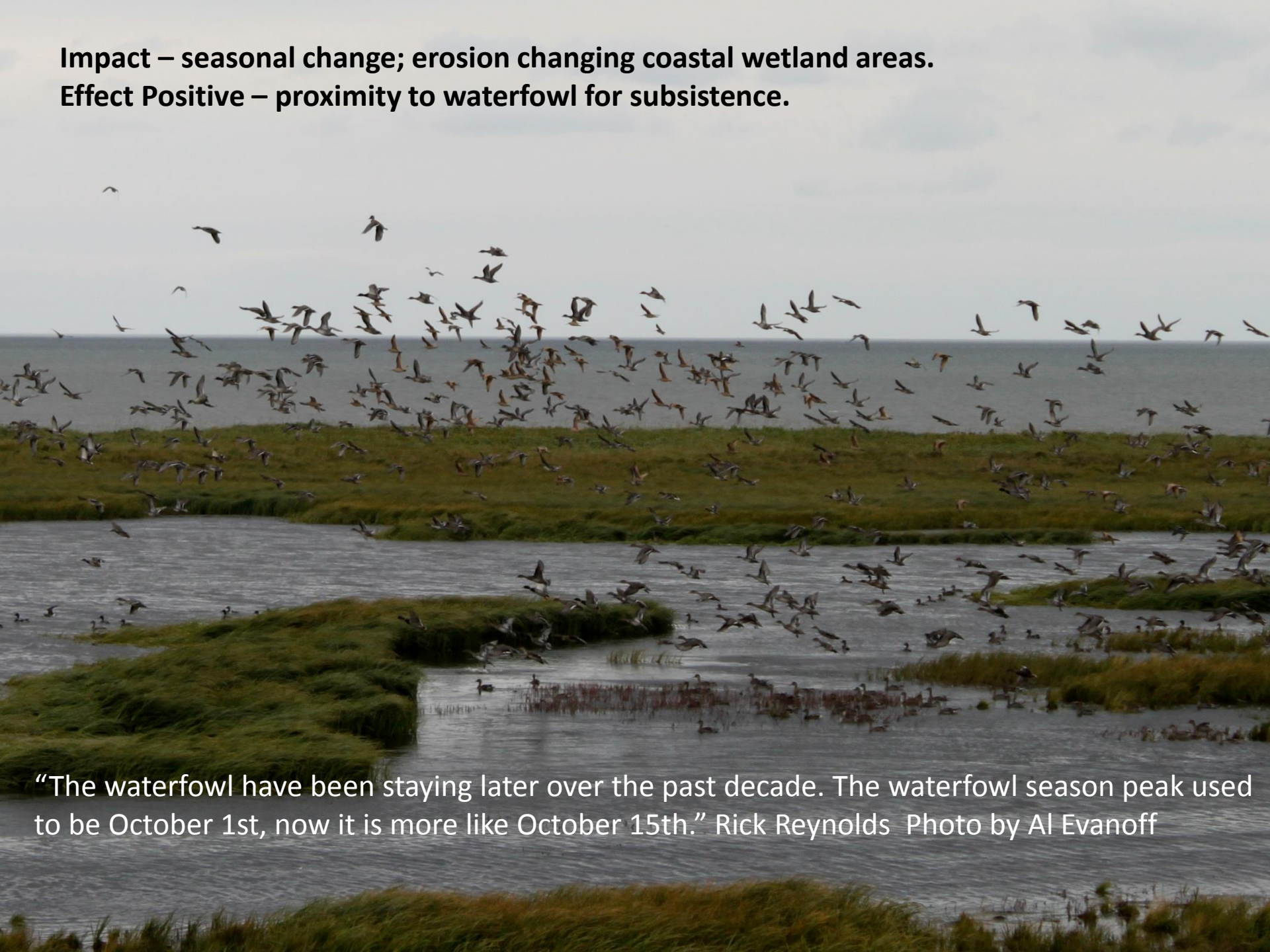
Report available at ANTHC website.

Impact - decreased berry harvest in some years.
Effect Negative – Food harvest, nutrition, food security.

"We had absolutely no berries this year, neither black, blue or cranberries. There were also lots of dead patches in the berry bushes. Sue Evanoff

Photo by Mike. Brubaker

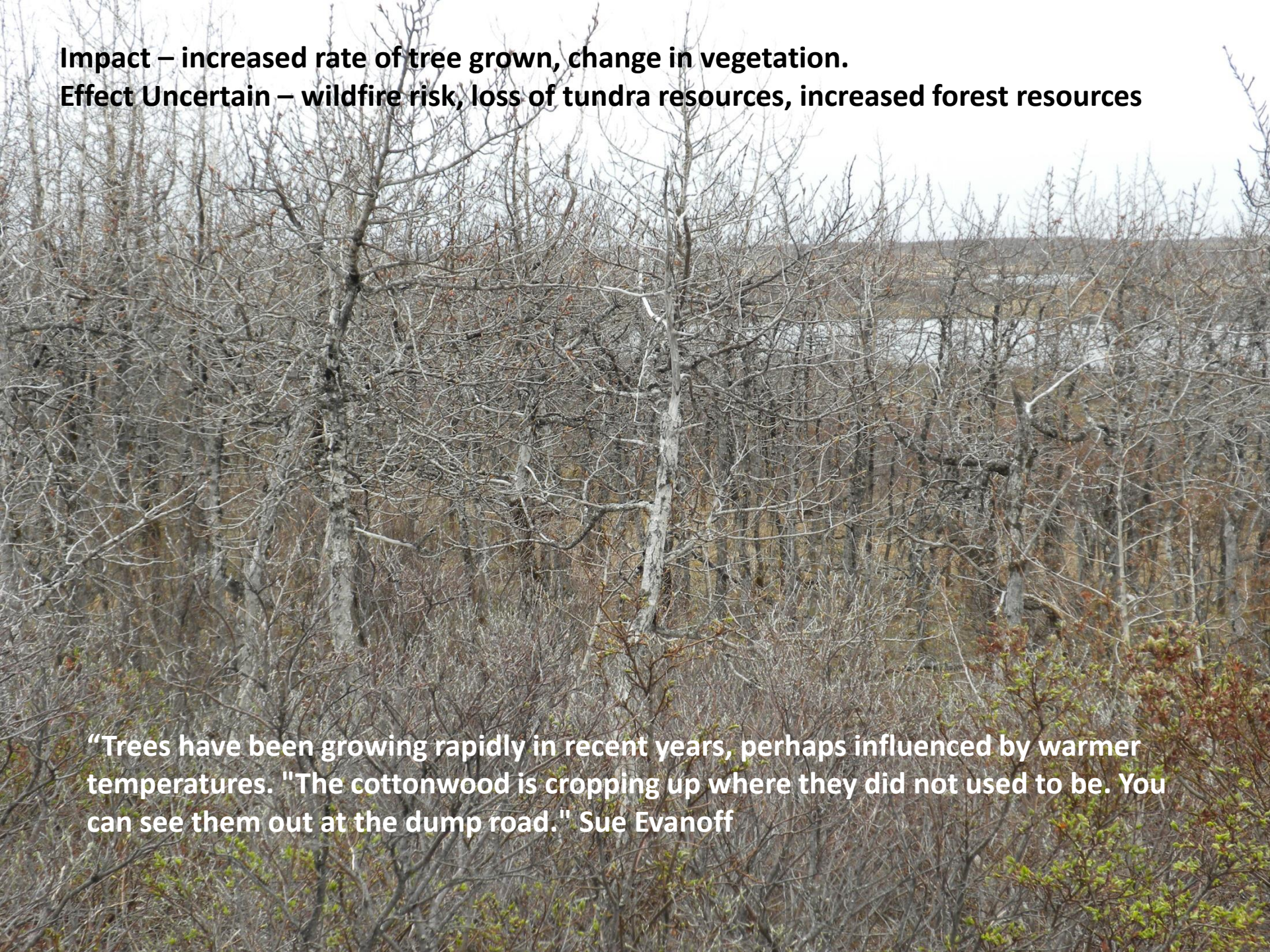
Impact – seasonal change; erosion changing coastal wetland areas.
Effect Positive – proximity to waterfowl for subsistence.



"The waterfowl have been staying later over the past decade. The waterfowl season peak used to be October 1st, now it is more like October 15th." Rick Reynolds Photo by Al Evanoff

Impact – less sea ice resulting in damaging storms, erosion and flooding
Effect Negative – risk of injury and loss of critical infrastructure.
Vulnerability - Port, roads, fish camps, and other vulnerable infrastructure.

Photo by Mike. Brubaker



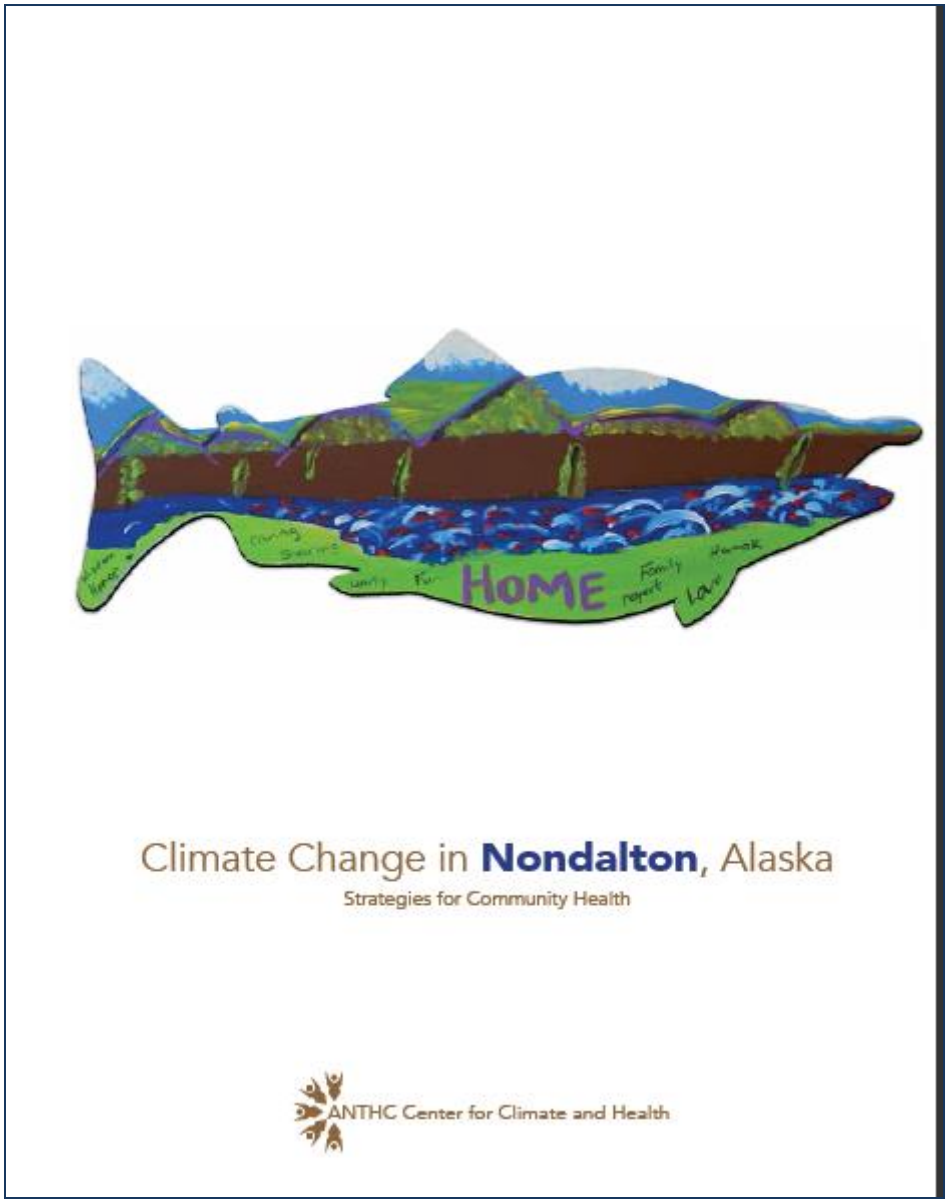
Impact – increased rate of tree grown, change in vegetation.
Effect Uncertain – wildfire risk, loss of tundra resources, increased forest resources

“Trees have been growing rapidly in recent years, perhaps influenced by warmer temperatures. "The cottonwood is cropping up where they did not used to be. You can see them out at the dump road." Sue Evanoff

Impact – sea level rise
Effect Mixed – increased flood risk (-), increased river (tidal / fetch) access for navigation (+)

A computer generated scenario (below) based on historic flood events. Sea level rise will increase flood risk and erosion in Pilot Point and other coastal communities.

Nondalton – A lake community



Key Topics – Nondalton

- Lake change
- Seasonal change
- Community source water
- Community sanitation
- Harvest change (caribou)
- Glacier change

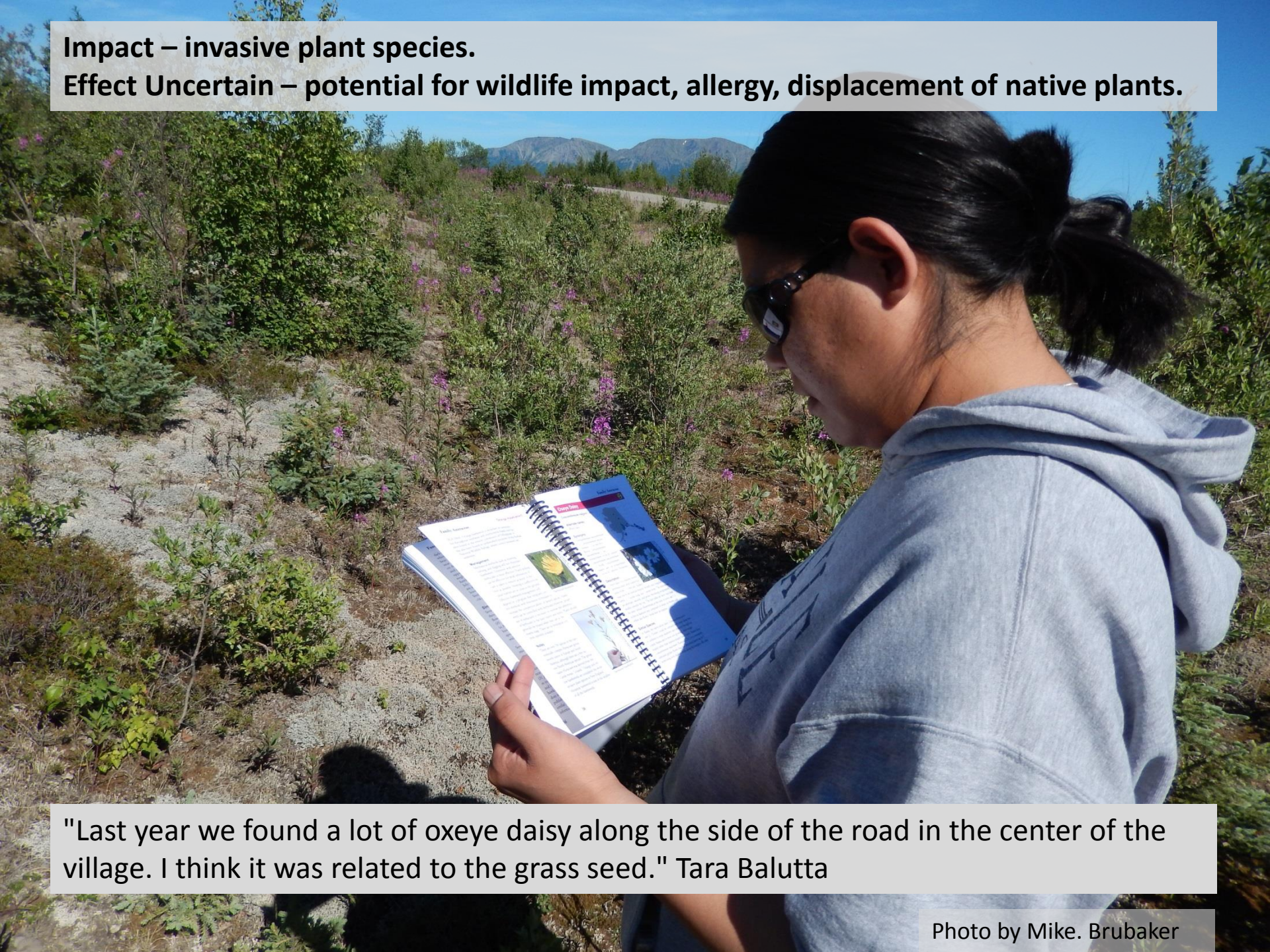
Report available at ANTHC website.

Impact – water level change
Effect Uncertain – critical infrastructure (-), navigation (+/-), fish habitat (+/-)

Photo by Mike. Brubaker

Impact – warming stream, lake and air temperatures.
Effect Negative – food harvest, drying fish, nutrition, mental health.

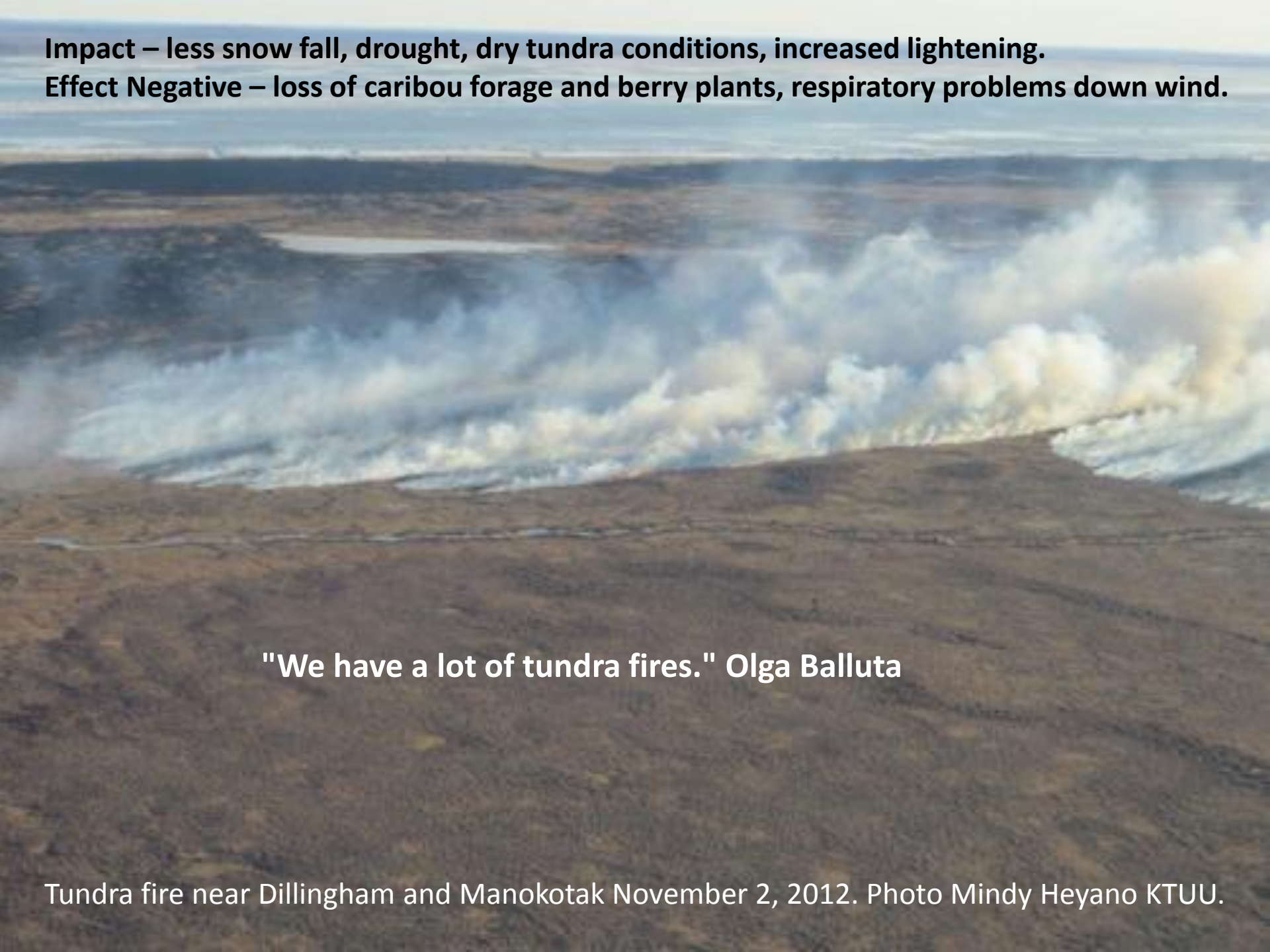
Impact – invasive plant species.
Effect Uncertain – potential for wildlife impact, allergy, displacement of native plants.



"Last year we found a lot of oxeye daisy along the side of the road in the center of the village. I think it was related to the grass seed." Tara Balutta

Photo by Mike. Brubaker

Impact – less snow fall, drought, dry tundra conditions, increased lightening.
Effect Negative – loss of caribou forage and berry plants, respiratory problems down wind.

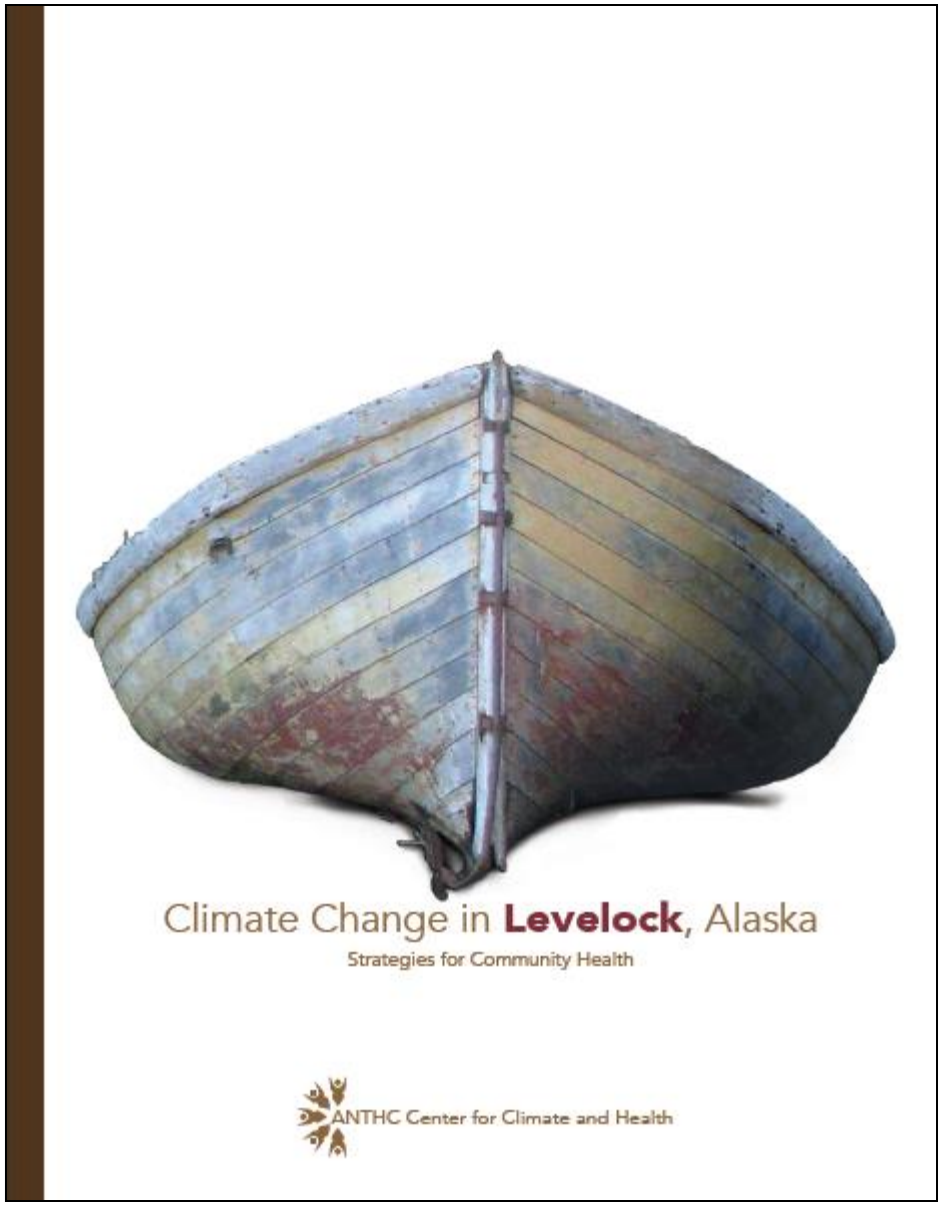


"We have a lot of tundra fires." Olga Balluta

Tundra fire near Dillingham and Manokotak November 2, 2012. Photo Mindy Heyano KTUU.

Levelock – A river community

Photo by Mike. Brubaker

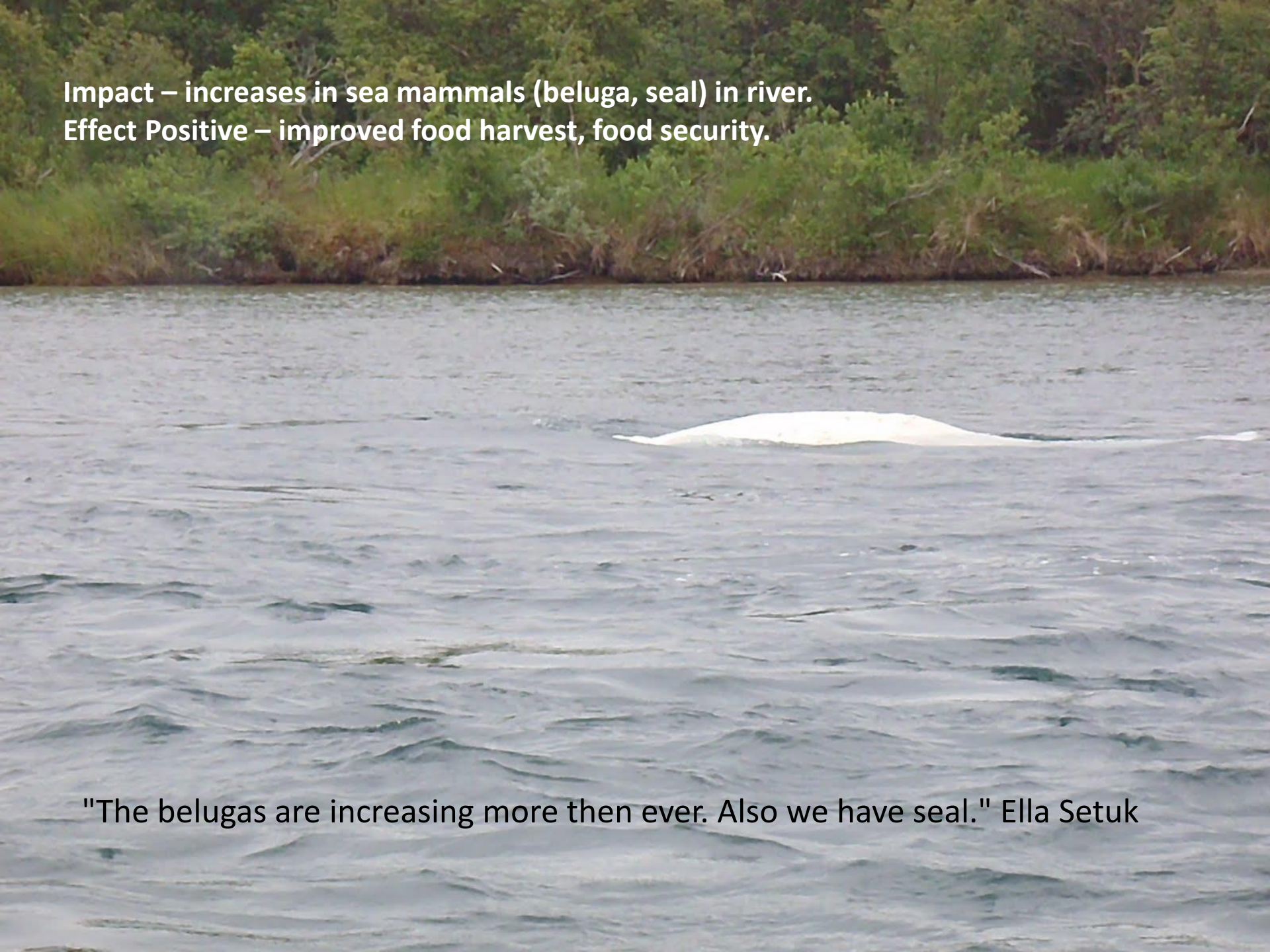


Key Topics – Levelock

- Erosion - river, tundra
- Air quality (dust)
- Harvest change – caribou(-), beluga (+)
- Food preservation
- River change
- Vegetation expansion
- Aggressive wildlife (bears, wolves)

Report available at ANTHC website.


Impact – river bank erosion.
Effect Negative – loss of critical infrastructure, river navigation.
Photo by Mike. Brubaker



Impact – increases in sea mammals (beluga, seal) in river.
Effect Positive – improved food harvest, food security.

"The belugas are increasing more then ever. Also we have seal." Ella Setuk


Impact – increasing dust and silt.
Effect Negative – respiratory irritant.
There are quite a few upper respiratory problems which could be related to dust, but more to the cold season. Donna Olsen, CHAP

Training to Improve Observation Capacity – the project also emphasized the importance of building local capacity to monitor climate change. New LEO network members were trained and provided assistance posting observations during project.

Photo by M. Brubaker

In 2013 eighty-eight posts were made statewide. During the report period 16 posts were made just by Bristol Bay LEO members, the highest for any region statewide for this measure. These posts are now available on the Bristol Bay Region LEO Map.

All posts are public and available on web accessible Google Map. The post were shared with other Network members and weekly with recipients of the *Climate and Health E-News*. A review of some of the Bristol Bay LEO outreach results during 2013 are provided in the following slides.

Rare brown bear sighting in January Port Heiden, January 9, 2013 (land animal) This bear was first spotted in Port Heiden at a remote residential area (Trapper Hill) than went through the Old HuddTownsite, passed the school and continued on to the Meshik Bay. This is a rare sighting to observe a brown bear in January. I believe he's starving so he was forced out of hibernation. Delores Anderson, LEO

Late winter storm disrupts transportation - Port Heiden, Alaska, March 7, 2013 (land) Erosion from severe storms on our public roads, transformers, water wells. If erosion continues to wash our roads out it will cost a lot of money to rebuild. And the flooding will ruin our electrical transformers and seep into our water wells. Shannon Matson, LEO

Fish kill - thousands of sticklebacks near Igiugig - Grants Lagoon, shore of Lake Iliamna, near Igiugig Alaska, September 14, 2013 (fish) Several hundred thousand (didn't actually count them) dead nine-spine stickle backs along with many more live ones in a small dead-end tributary from the lagoon to Iliamna Lake. A dozen or more dead sucker fish as well as some live ones in the same stretch. The lagoons are an important subsistence resource to our community as we often fish pike in the lagoons. We assume that the stickle backs and sucker fish are important food sources for the resident pike. Christina Salmon, LEO

Warm weather and open water on Lake Aleknagik

Aleknagik, Alaska, January 28, 2014 (lakes, weather) This is a video of people coming across Aleknagik Lake to town. We have never traveled by boat across the lake in January. Usually it is frozen even at the mouth and we are traveling by snow machine over the ice. Never in history have we fished in January for smelt. But the water is open on the lake and we have been catching smelts right by Daniel Chythlook's house. It is a good thing in some ways. We sent a boxes of smelt to Manokotak because their subsistence area was contaminated by the sinking of the Lonestar barge last summer. They were really glad to receive the smelt. This weather has been really something. Hardly any snow and the mountains are all bare. I saw a caddis fly hatch on January 8th. We are wondering if the bears have been flooded out and will start to roam around. All the dogs have been barking at night. Tina Tinker, LEO

Video by Tina Tinker,
LEO YouTube Channel

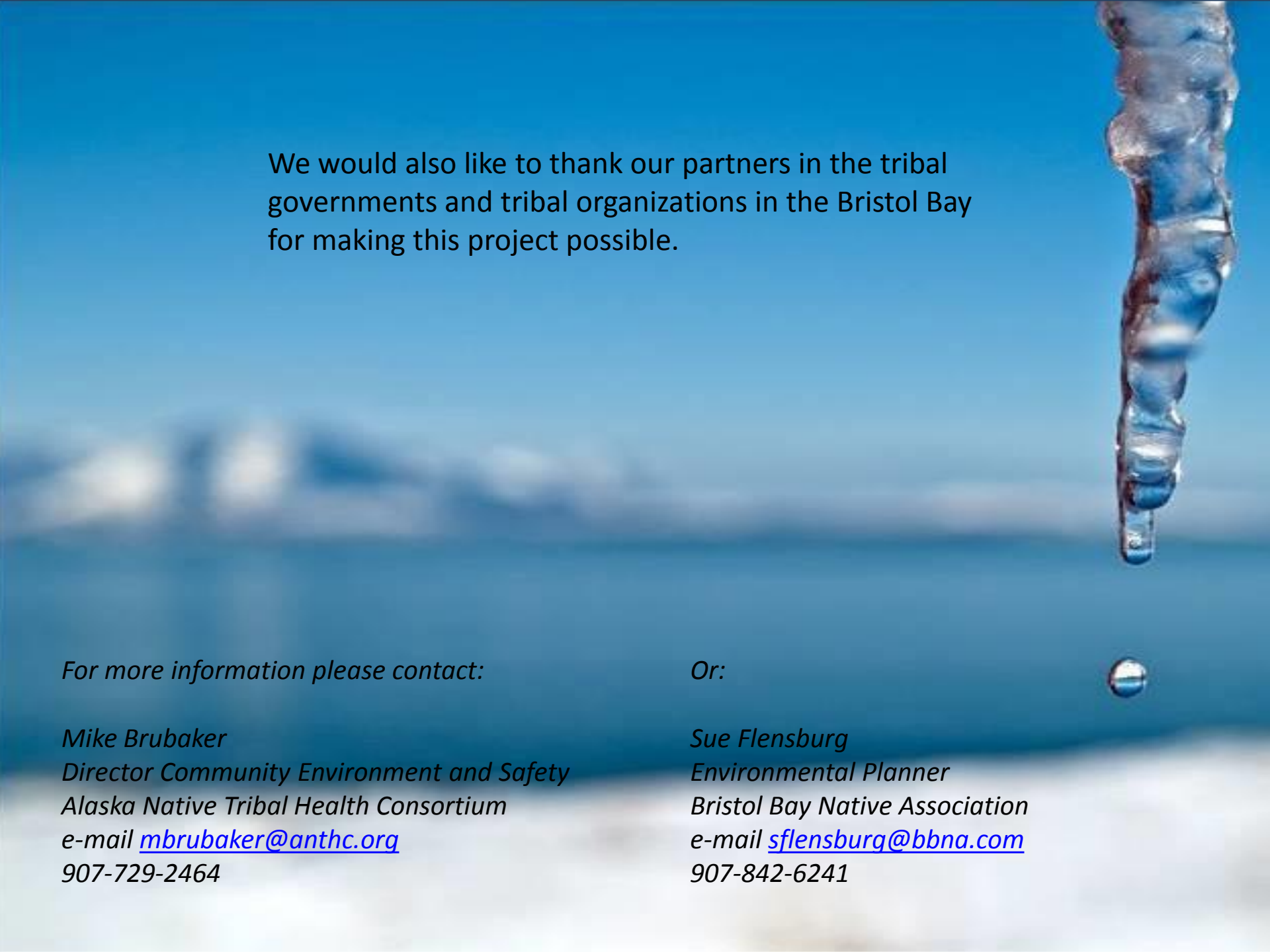
- Evidence of climate change impacts have been recorded in every community that has participated in the project.
- Impacts that are positive and negative for community health have been described.
- Site visits confirm impacts from erosion, flooding, seasonal change, extreme weather and food security among other topics.
- Important health effects findings include respiratory issues related to air quality, vulnerable water system, sanitation and health service critical, food security issues related to changes in harvest and food preservation, and injury risk related to changing environment. Mental health is also a concern especially related to stress caused by unusual environmental conditions.

Photo by M. Brubaker

Other products:

- Nondalton is in the process of developing a health impact assessment project with the University of British Columbia as a result of interested raised through the assessment reports.

Kvichak river from Levelock. Photo. Mike Brubaker



We would also like to thank our partners in the tribal governments and tribal organizations in the Bristol Bay for making this project possible.

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